INSTRUCTION MANUAL

SYNC SOURCE 1303A

QUAD RATE TV
SYNC GENERATOR ACCESSORY

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QUAD RATE TV
SYNC GENERATOR ACCESSORY

Series H

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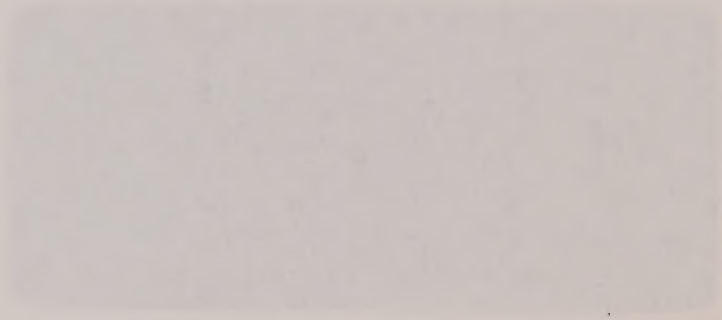

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Vii®

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NOTICE

This manual is prepared on the premise that the user is familiar with television system terms and concepts, and particularly is acquainted with the use of electronic test instruments (such as an oscilloscope) to interpret television waveforms and to relate the content of such waveforms to the pattern which would be produced on a typical television display device. If this is not the case, background reference material is suggested as follows:

a. Glasford, Glenn M., Fundamentals of Television Engineering (New York, NY: McGraw-Hill Book Co., Inc., 1955).

b. Showalter, Leonard C., Closed-Circuit TV for Engineers and Technicians (Indianapolis, IN: Howard W. Sams & Co., 1969).

c. Hansen, Gerald L., Introduction to Solid-State Television Systems (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1969).

d. Fink, Donald G. (Ed.), Television Engineering Handbook (New York, NY: McGraw-Hill Book Co., Inc., 1957).

Please contact Visual Information Institute if additional information is desired on television tests and measurements or about application of this instrument.

You must read the instruction manual completely before connecting Vii test equipment for operation. Observance of a few procedures will provide greater operator convenience and will assure most effective application of the equipment as well as provide safety to the user.

(OVER)

CAUTION

Even low voltages commonly present in transistorized circuits are potentially dangerous. Additionally, full line voltage is present on fuse terminals, power switch terminals, and other exposed points within the interior of the unit, and are accessible when the cover of the equipment is removed. Caution should be exercised, as follows:

a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.

b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone. Service and calibration should be attempted only by a qualified electronics technician.

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INTRODUCTION

This instruction manual contains all essential information for the proper connection and use of the Signal Source CCTV Generators; this manual contains maintenance information as well.

This device contains circuits which are considered proprietary. Duplication of Signal Source equipment is not authorized without the expressed, written consent of Visual Information Institute, Inc. These instruments, as described in this manual, are manufactured under U. S. Patent No. 3,483,479 plus other domestic and foreign patents pending.

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b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone. Service and calibration should be attempted only by a qualified electronics technician.

APPLICATIONS

Sync Source generators develop precise synchronizing pulses for exact and effective synchronization of closed circuit television devices, including test pattern generators, cameras, display devices, etc. This particular generator, Sync Source 1303A, provides synchronizing waveforms as specified by Electronic Industries Association Standards RS-170, RS-330 and RS-343. In addition to H Drive, V Drive and Mixed Blanking, this unit generates a Composite Sync signal which includes front porch delays in the vertical and horizontal sync plus optional serrations and equalizing pulses in the vertical interval.

This instrument is useable at any one scanning rate, including "standard" 525, 675, 729, 875, 945, 1023, 1029 and 1225/60 Hz field rates and 625/50 Hz field rate, all 2:1 interlace; other "non-standard" line numbers may be employed by special interconnection and use of the proper master oscillator frequency according to factory instructions. The scan rate selector position marked "SPECIAL" provides the 729/60 scan rate unless otherwise specified by customer order. All proportions of the horizontal rate waveforms are adjustable by potentiometer control, permitting exact matching of this unit to other existing equipment, allowing test of apparatus under realistic operational conditions. Vertical proportions of Blanking, Drive and Sync are counted from the horizontal rate.

The synchronizing generator provides a BROADCAST format composite Sync signal which includes front porch delays in the vertical and horizontal sync and serrations and equalizing pulses in the vertical sync interval. Format selection provides either the BROADCAST format, an INDUSTRIAL sync waveform without equalizing pulses and serrations, or a MILITARY waveform which has no horizontal front porch or h-rate pulses in the V sync front porch interval. The generator normally develops an interlaced (2:1) television raster; non-interlace (1:1) condition can be developed by special interconnection. Refer to OPTIONS IN OPERATION for further information on available modifications.

Change of scan rate and pulse format is readily accomplished in this generator as explained in detail in the SCAN RATE CHANGE AND SYNC FORMAT section.

TECHNICAL SPECIFICATIONS

This specification defines the electrical and mechanical characteristics of an accessory sync generator which develops precise pulses as required to properly synchronize the test pattern generator section of the parent unit as well as television cameras, display devices, special effects generators, etc. It is designed to provide waveforms for various sync formats, and can be calibrated to conform to EIA Standards RS-170, RS-330 and RS-343. Adjustment is provided for all horizontal (h-rate) pulses. This permits operation at either the nominal value or anywhere within the tolerance region set forth by standards. Scan rate is selected automatically by front panel control on the parent unit.

ELECTRICAL CHARACTERISTICS

Functions . . Development of precise signals for 2:1 interlaced television synchronizing.

Output Signals (Video Format):

- Type . . . H Drive, V Drive, Blanking, Sync
- Level . . . 4v. peak
- Polarity . Negative-going pulses
- Impedance . 75 ohm source impedance
- Coupling . A.C. (capacitive)
- Risetime . Nominally 100 nsec.
- Controls . External:

  Scan Rate Selection (parent unit)

  Internal:

  - H Front Porch
  - H Sync Width
  - H Blanking Width
  - H Drive Width
  - 2H Serration Width
  - 2H Equalizing Width
  - Pulse Amplitude

Scan Rates . . Any one of four pre-selected scan rates, 2:1 interlace or 1:1 non-interlace, as selected by front panel switch. The following scan rates are standard:

525/60 875/60 1023/60 1225/60
625/50 945/60 1029/60 729/60

Other "non-standard" rates can be provided to customer specification.

Waveform . . . Internal selection of Industrial, Military or Broadcast type waveform, including 2H equalizing pulses and serrations where appropriate, in accordance with EIA Standards RS-170, RS-330 and RS-343.

Power Requirement . . D.C. voltages from parent unit, at the following nominal current values.

+5v. @ 700 ma
-5v. @ 58 ma
+12v. @ 63 ma
+D.C. unregulated @ 4.5 ma

MECHANICAL CHARACTERISTICS

Enclosure . . Custom package for accessory installation in appropriate Signal Soruce CCTV Test instruments.

Weight . . . . Approximately 4 lbs.

Operating Temperature Range . 0°C to +50°C.

NOTE: In the interest of product improvement, these specifications are subject to change without notice.

MODIFICATIONS

This section contains a description of modifications or changes to instruments to conform to a particular customer's request or to correct documentation to include late revisions in circuitry configuration or components included to improve performance of the instrument.

- -

INSTALLATION

Sync Source Accessory CCTV Sync Generators are supplied from the factory mounted inside the CCTV test instrument cabinet. Observe the instructions for installation of the parent unit prior to initial operation.

CONNECTIONS

Accessory units provide output pulses at the generator cabinet rear. The BNC cable connectors are marked as to function.

Outputs should be terminated properly to assure best pulse shape, without ringing or reflections. If the sync generator outputs are also used elsewhere coaxial cable should be used to connect sync generator outputs (H Drive, V Drive, Blanking and Sync) to their point of utilization. All outputs are source terminated to drive 75 ohm cable such as RG-11/U or RG-59B/U.

All sync generator waveforms as used in pattern development are presented at front panel for reference, whether from internal or external source.

If the sync generator accessory is included, the instrument serial number will identify the type of accessory by option letter, for instance Signal Source 1203D. A separate instruction manual is provided for the accessory.

OPTIONS IN OPERATION

Many operating modes are possible in this instrument in addition to those selected as "standard" to comply with most application requirements. Following is a summary of some other options which may be of interest. Many other operating conditions are possible. Please contact the factory for detailed information on implementation of these or other variations in operation.

1:1 INTERLACE (NON-INTERLACE)

While the "normal" television system operates at 2:1 interlace, some applications require no interlace (sometimes referred to as 1:1 interlace). This instrument can be configured, by harness wiring change, for 1:1 interlace operation on any scan rates, as desired. Caution is necessary in describing the rate desired. This is a factory installed modification. Note that if a rate is changed to 1:1 interlace, this removes capability for 2:1 interlace operation for that rate. Front panel control to select 2:1 or 1:1 is available as a factory option.

TTL FORMAT PULSES

TTL pulse output is available as a factory modification to provide output synchronizing pulses of H Trigger, V Trigger, Blanking, Sync, H Sync and V Sync. The TTL PULSE OUTPUT card (L-2118) can provide any one three types of TTL compatible outputs depending upon the application:

1. The 74128 Line Driver is provided, unless otherwise specified, with source termination resistance of 75 ohms. This configuration is optimum for driving long lengths of coaxial cable, providing 2v. pk-pk of signal when cable is terminated, 4v. pk-pk with an unterminated line.

   Signal level may be increased by replacing source terminating resistors R44, R45, R46, R47, R48 and R49 by a jumper. Source impedance then will be approximately 20 ohms providing about a 3v. pk-pk signal with a terminated cable.

2. The 7428 buffer may be substituted for the 74128 line driver. This provides a standard TTL gate output with nominal 4v. pk-pk signal. This configuration is suitable for driving equipment with TTL gate inputs, but is not recommended for long cable runs.

3. The 7433 open collector buffers may be substituted for the 74128 line driver. This configuration is suitable for use with equipment which has TTL gate inputs with a collector load connected to +5v. Use caution when using this configuration; be sure grounds are connected between units and that connections are made with the power off in both pieces of equipment being interconnected This output is not recommended for long cable runs.

OPERATION

The Sync Source is ready to operate once power and signal connections are complete. Although the instrument was carefully calibrated at the factory prior to shipment, it is suggested that calibration be checked. Refer to the TROUBLESHOOTING section of this manual if there may be an indication of defective circuitry. The function of all controls is described fully in CONTROLS AND ADJUSTMENTS.

MAINTENANCE

Signal Source Generators have been designed to operate for long periods of time without the need for frequent attention. As with any laboratory equipment, periodic performance verification and calibration as found to be required, on a regular schedule, is of value. In most ordinary applications, performance verification is suggested at six month intervals. If the instrument is being used as a reference standard, performance verification at three month (90 day) intervals may be more appropriate.

CIRCUIT CARD AND CONTROL LOCATIONS

CABINET LAYOUT

This instrument is packaged in a laboratory cabinet suitable for bench or rack mount use. It can contain two or three card files, including from 44 to 66 circuit cards, 22 per section. Text description is based upon orientation as outlined below.

In some instances, Section A is used for optional accessories only and may not be included if options are not installed. This provides as small a cabinet as possible for all configurations.

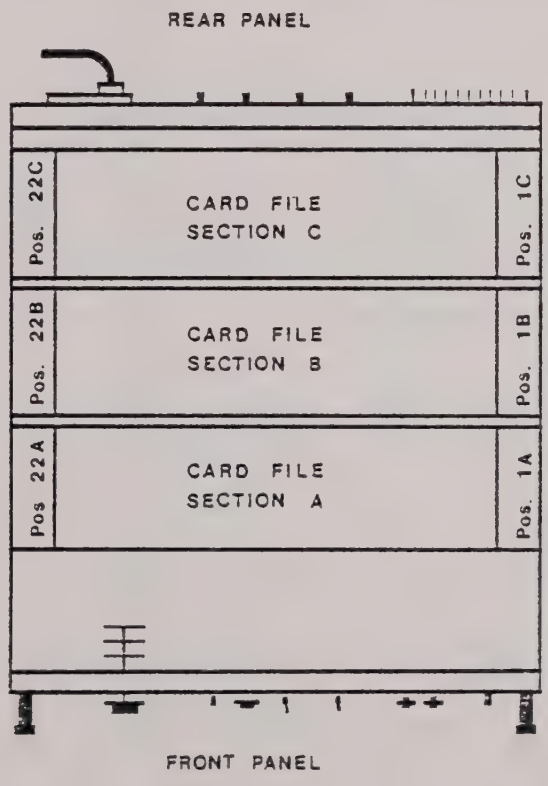


Figure 1 - Top View of Instrument

CIRCUIT CARD LOCATIONS

Circuit cards in the Sync Source 1303A accessory are located in the positions listed below. The sync generator package is installed in the circuit card file immediately behind the front panel of the parent unit (Section A). Remove the generator top cover for access to internal controls.

Insertion of cards into the improper slot may cause damage and, of course, the generator will be inoperative. Be sure to reinsert circuit cards into the correct location if they are removed, and establish that they are firmly seated into the connector. Cards are keyed so they cannot be inserted backwards; an attempt to force them in the wrong way will result in a broken connector.

SECTION A (Front)

POS.	NO.	GROUP	NAME
7	L-2118	5	TTL Pulse Output (optional)
8	- not used -		
9	L-2003	1	Pulse Output
10	L-2212	0	Sync Format
11	L-2152	1	Multirate Sync
12	L-2101	17	Quad Rate Mono - 2H Serrations
13	L-2101	16	Quad Rate Mono - 2H Equalizing
14	L-2101	15	Quad Rate Mono - 2H Front Porch
15	L-2101	14	Quad Rate Mono - 2H Sync
16	L-2101	13	Quad Rate Mono - H Drive
17	L-2101	12	Quad Rate Mono - 2H Blank
18	L-2149	1	Quad Rate Master Oscillator/Blank
19	L-2039	0	Multirate Sync Count
20	L-2037	8	Multirate Count Select
21	L-2037	9	Multirate Count Select
22	L-2037	10	Multirate Count Select

INTERNAL CONTROL LOCATIONS

The circuit cards may vary in orientation for various instruments. Therefore, the description of control locations has been standardized as to location on the circuit card itself. Locations are keyed to the circuit card as viewed from component side, connectors down, as shown below:

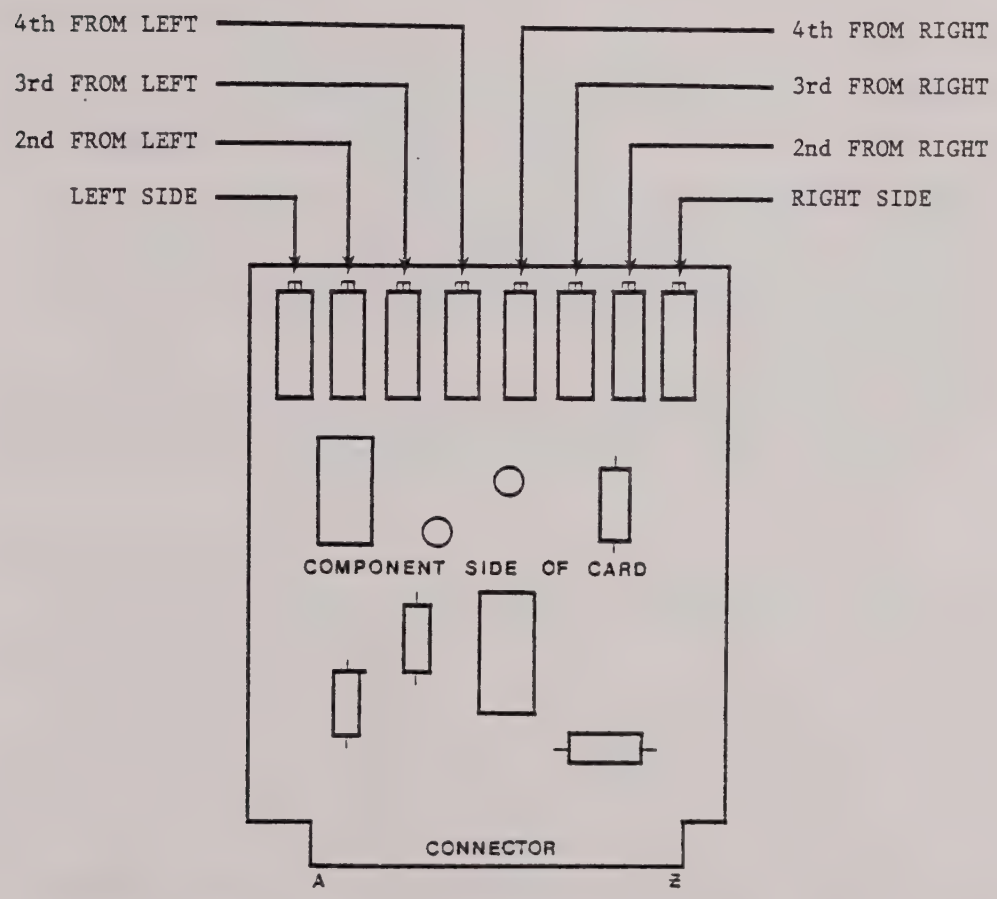


Figure 2 - Circuit Card Control Orientation

CONTROLS AND ADJUSTMENTS

EXTERNAL CONTROLS (Front Panel - parent unit)

SCAN RATE . . . . . Switch which selects scan rate as indicated by pushbutton selectors.

INTERNAL CONTROLS

Access to internal adjustments is by removal of the generator top cover; loosen eight flat head screws and lift the cover for access to the interior.

Circuit cards are located in positions listed on page 20, CIRCUIT CARD LOCATIONS. Sections A, B and C are located as shown in Figure 1. Refer to Figure 2 for location of controls on the circuit cards; "fourth from left" means position four on the card - not necessarily the fourth control on the card.

The instrument contains three internal circuit card decks, as noted above. Section A (front), contains the sync generator section while Sections B and C (center and rear) contain pattern generator and power regulation circuits.

Section A (Front)

All pulse proportions are developed by monostable multivibrators on the QUAD RATE MONO circuit cards. Control groupings are as follows:

Right side	Scan Rate A
Second from right .	Scan Rate B
Third from right . .	Scan Rate C
Fourth from right .	Scan Rate D

H BLANKING WIDTH . . The controls on the QUAD RATE MONO card, Position 17A, adjust the width of the H blanking pulse.

H DRIVE WIDTH . . . The controls on the QUAD RATE MONO card, Position 16A, adjust the width of the H drive pulse.

H SYNC . . . . . The controls on the QUAD RATE MONO card, Position 15A, adjust the width of the H sync pulse.

H FRONT PORCH . . The controls on the QUAD RATE MONO card, Position 14A, adjust the width of the H front porch pulse.

2H EQUALIZING . . The controls on the QUAD RATE MONO card, Position 13A, adjust the width of the 2H equalizing pulses.

2H SERRATIONS . . The controls on the QUAD RATE MONO card, Position 12A, adjust the width of the 2H serration pulses.

SYNC FORMAT . . . Four sets of on-card switches (for Rates A, B, C or D) allow selection of either the Broadcast, Military or Industrial sync format, as illustrated in Figure 4 and described on page 32. Switches are located on the SYNC FORMAT circuit card (Position 10A). Refer to Table III for proper selection of format desired.

SCAN LINES PER 2 FIELDS
V BLANKING WIDTH
V DRIVE WIDTH . . These values are determined by selector diode placement on the MULTIRATE COUNT SELECT circuit card, Groups 8, 9 and 10. Refer to Drawings S-2037, L-2037 and PL-2037 at the rear of this manual. The master oscillator frequency for each scan rate is established by the crystal installed into the QUAD RATE MASTER OSCILLATOR/BLANK circuit card. Refer to drawing S-2149, L-2149 and PL-2149.

OUTPUT SIGNALS

The synchronizing ("sync") generator produces pulses which are used to synchronize camera, display and other television devices in developing the t.v. raster. These pulses control the order in which the television picture will be produced. Four basic types of electrical pulse signals have become commonly used for such purposes, including H Drive, V Drive, Blanking and Sync, as described by EIA Standards RS-170, RS-330 and RS-343. All pulses are generated from a very stable master oscillator which is crystal controlled. Digital techniques are used to generate pulses at the horizontal and vertical rates of the scan rate to be used. These include:

H DRIVE is a pulse train in which a pulse starts at the end of every television scanning line. Its function is to mark the time interval between the end of one line and the start of another; the pulses may be used to control horizontal deflection "flyback" and signal processing. The pulse train is continuous, uninterrupted even during the vertical synchronizing interval. These pulses are useful for synchronizing an oscilloscope when inspecting the television waveform at horizontal line rate, provided in Video format only.

V DRIVE is a pulse train in which a pulse starts at the end of each television field. Its function is to mark the time interval between the end of one television field and the next; these pulses may be used to control vertical deflection "flyback" and signal processing. These pulses are useful for synchronizing an oscilloscope when inspecting the television waveform at vertical field rate, provided in Video format only.

BLANKING is a mixture of horizontal and vertical information intended to control the "blackout" of the television system during deflection return between horizontal lines and vertical fields. These pulses are wider than drives or sync to insure that all transitions are made invisible. This signal is provided in both TTL and Video formats.

SYNC is a complex combination of horizontal and vertical pulse information intended to control the decoding of a television signal by a display device, recorder or other type of video processing equipment. Usually it is mixed with the video information to produce a composite picture signal which is distributed for general use, and is provided in both TTL and Video formats.

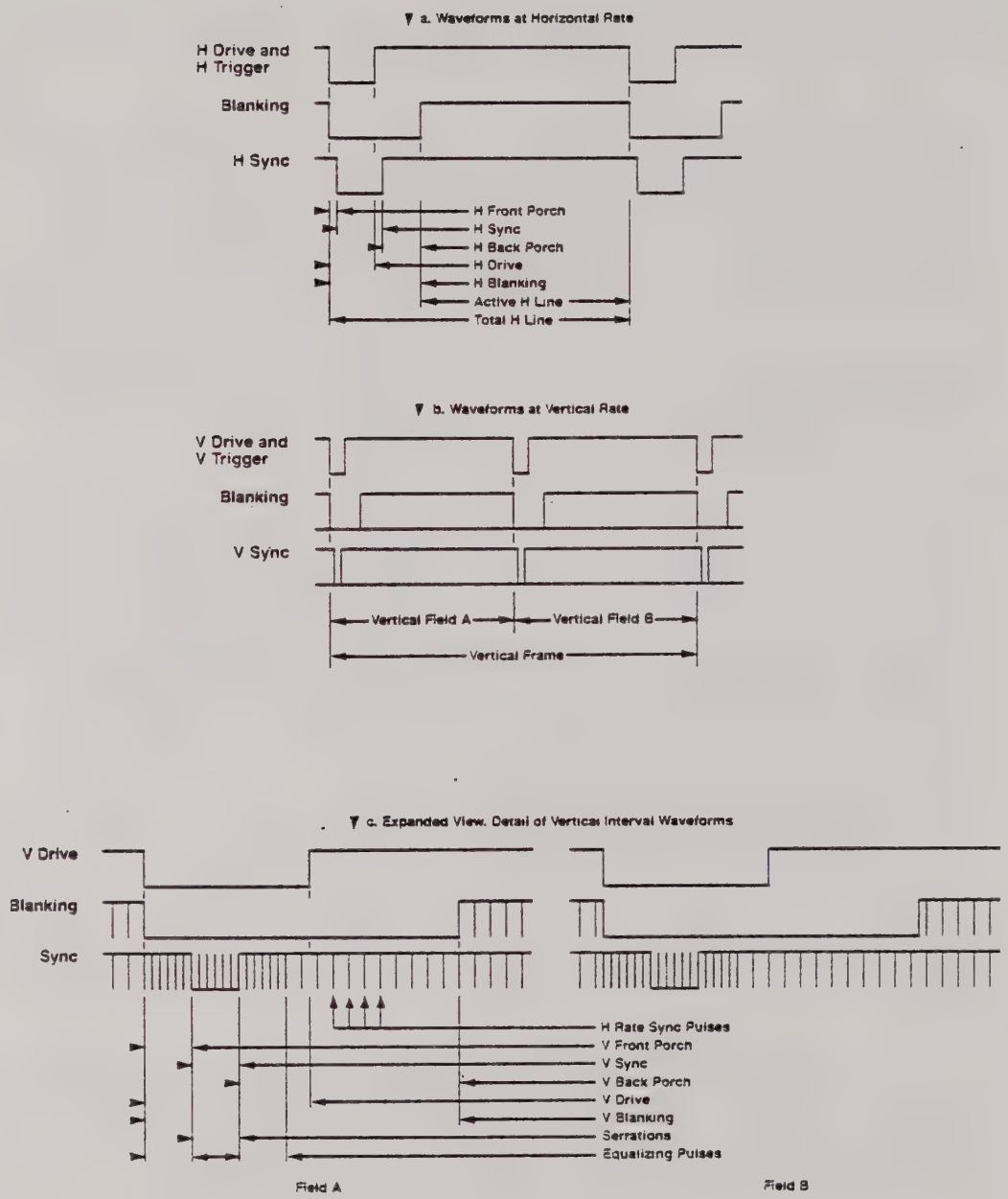


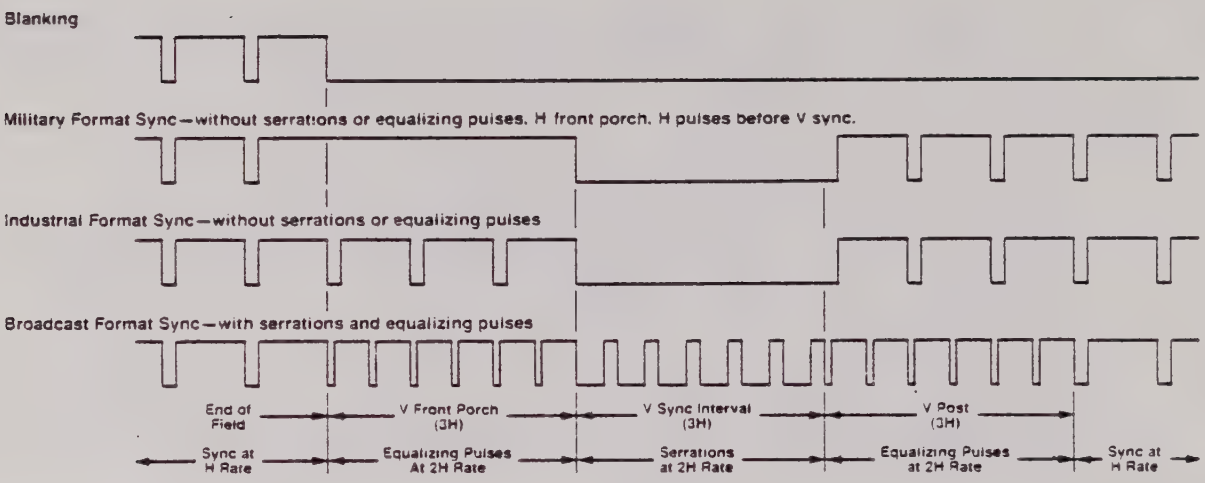
Figure 3 - Typical Sync Generator Output Waveforms

H SYNC is the horizontal sync pulse, as provided in the composite Sync signal but developed continuously even through the vertical interval. It is provided for the TTL format only.

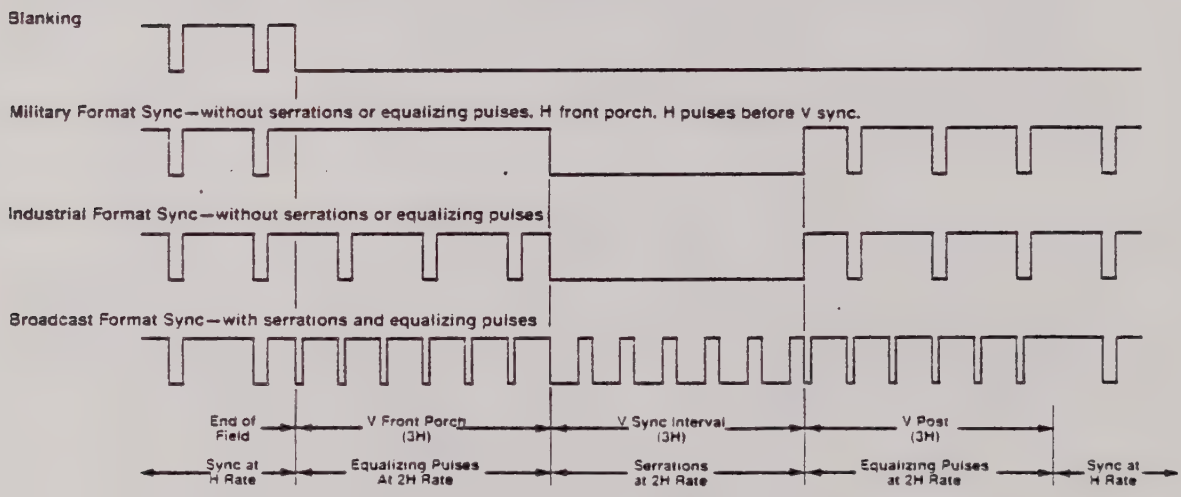
V SYNC is a vertical rate pulse coincident with the vertical sync interval in the composite Sync signal. The leading edge is fixed at three line intervals after the leading edge of V Blanking. V Sync pulse width is three lines wide. Position and width are clocked, not adjustable, and is provided in the TTL format only.

H TRIGGER is a continuous, horizontal rate pulse train which is similar to H Drive, but both phase and width are adjustable, independent of H Drive. The leading edge may be adjusted to lead or lag the leading edge of H Drive. It is provided in TTL format only.

V TRIGGER is a vertical rate pulse similar to V Drive, but phase (position) and width may be selected independent of V Drive; position timing is referred to the leading edge of V Drive.


Blanking
Military Format Sync—without serrations or equalizing pulses. H front porch. H pulses before V sync.
Industrial Format Sync—without serrations or equalizing pulses
Broadcast Format Sync—with serrations and equalizing pulses
End of Field
V Front Porch (3H)
V Sync Interval (3H)
V Post (3H)
Sync at H Rate
Equalizing Pulses At 2H Rate
Serrations at 2H Rate
Equalizing Pulses at 2H Rate
Sync at H Rate

a. "Even" Field


Blanking
Military Format Sync—without serrations or equalizing pulses. H front porch. H pulses before V sync.
Industrial Format Sync—without serrations or equalizing pulses
Broadcast Format Sync—with serrations and equalizing pulses
End of Field
V Front Porch (3H)
V Sync Interval (3H)
V Post (3H)
Sync at H Rate
Equalizing Pulses At 2H Rate
Serrations at 2H Rate
Equalizing Pulses at 2H Rate
Sync at H Rate

b. "Odd" Field

Figure 4 - Detail of Vertical Sync Interval, 2:1 Interlaced Raster

SCAN RATE CHANGE AND SYNC FORMAT

This instrument has been designed for operation at various scan, field and frame rates at 2:1 interlace. This includes all rates specified by American EIA Standards RS-170, RS-330 and RS-343 which specify field and frame rates at 60 Hz and 30 Hz respectively, plus European rates which employ a 50 Hz field rate and 25 Hz frame rate, and other non-standard rates. Operation in a 2:1 interlaced or non-interlaced condition (1:1) is possible by proper selection of scan rate as described below.

Instrument controls are designed to cover the ranges required by EIA standard scan rates; components are stocked by the factory for these rates. Commonly used pulse proportions are shown on Table I, page 36. Contact the factory if pulse width values for non-standard scan rates are desired.

A scan rate is determined by the number of scan lines per field and the desired field repetition rate. The master counter determines the rate at which horizontal lines are developed and that, in turn, determines what the frequency or repetition rate of the television field will be. By definition of 2:1 interlace, two fields constitute a frame; a frame is defined as one complete presentation of raster information. Therefore, the designation of 525/60/30 indicates that:

a. There will be 525 horizontal scan lines per frame.

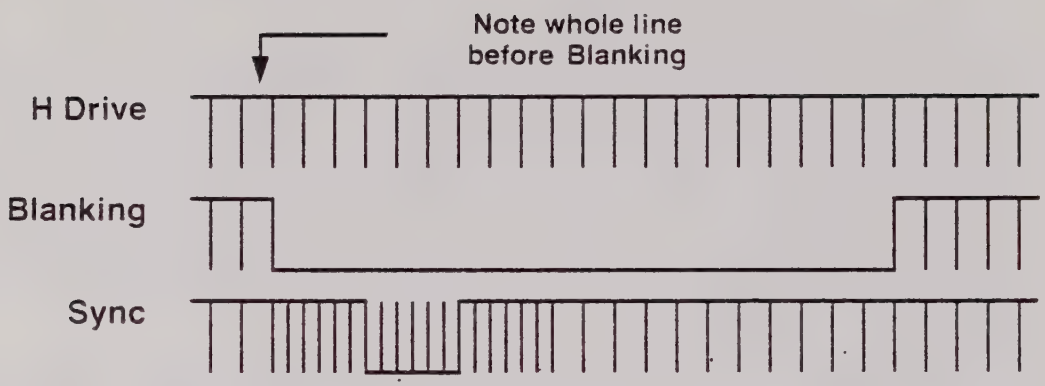
b. The field rate shall be 60 Hz.

c. The frame rate shall be 30 Hz.

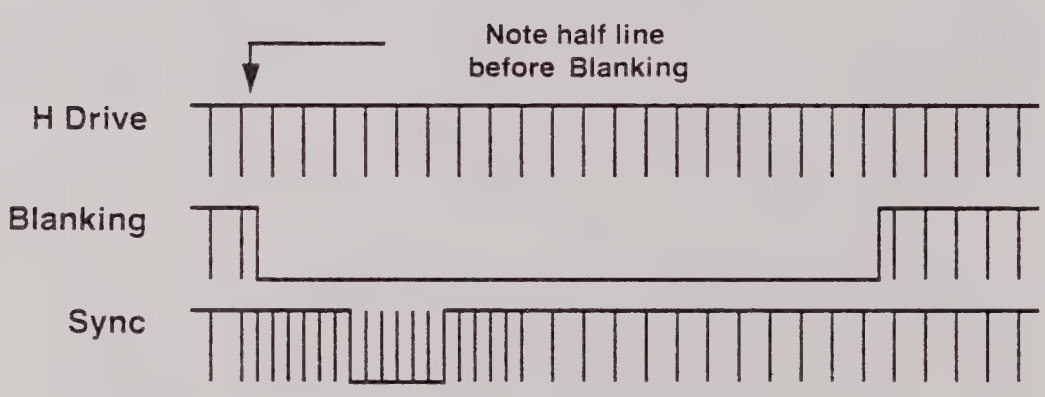
d. The ratio of field repetition rate to frame repetition rate determines the interlace ratio will be 2:1, which indicates that there will be two fields per frame, each field containing one-half of the total scanning lines - in this case 262.5.

Television systems operate at many different scan rates. Complete specification of a rate requires information to completely define the following:

- Horizontal scanning line repetition rate (usually in kiloHertz, kHz).
- Number of scanning lines to be developed in two television fields.
- The number of television fields which make up a complete frame.



a. Start of "Even" Television Field



b. Start of "Odd" Television Field

Figure 5 - Detail of 2:1 Interlace

- The width of pulses present within the various synchronizing waveforms:

H Drive	H Blanking
V Drive	V Blanking
H Sync	H Front Porch
2H Serrations	2H Equalizing

Most television systems are "interlaced" to avoid a visible flicker in the display, usually at 2:1 ratio. Thus 2:1 interlace ratio means that two entire display "fields" must be developed to generate one "frame", or complete image. For example, the most common rate of 525/60 indicates that:

- There are 525 scanning lines per television frame.
- The field rate is 60 Hz. That is, one television field is developed in 1/60 second.
- Unless specified otherwise, it is assumed that the interlace ratio is 2:1. That is, the frame, a complete image, will be composed of two fields. Therefore, one frame is produced in 1/30 second. Each field will be composed of half the number of scanning lines per frame, in this example, 262.5.

Television operation at so-called 1:1 interlace, or non-interlace, is becoming more prevalent. Care must be taken in describing such operation to avoid confusion.

There must be a whole number of scanning lines in each field for 1:1 interlace, whereas to obtain 2:1 interlace each field must have a half line. For example, often it is desired to develop a non-interlace condition for the common 525/60/2:1 interlace system. This may be done by adding a one-half line to the field, resulting in:

ORDINARY SYSTEM	SCAN LINES IN TWO FIELDS	SCAN LINES PER FIELD	FIELD RATE	FRAME RATE
525/60/2:1 interlace	525	262.5	60 Hz	30 Hz
MODIFIED SYSTEM				
(1:1 interlace)	526	263	59.88 Hz	59.88 Hz

The format of H drive, V drive and blanking is the same for all rates. The sync waveform can occur in any one of three formats according to application requirements, as shown in Figure 4:

BROADCAST . . The NTSC convention provides 2H rate equalizing pulses for three scanning line intervals (six pulses) before and after the vertical sync interval, 2H rate serrations during the three line vertical sync interval (six pulses) and horizontal front porch as specified in EIA Standard RS-170 and shown as optional in EIA Standards RS-330A and RS-343A.

INDUSTRIAL . . Sync, the same as described under BROADCAST, without equalizing pulses and serrations, per EIA Standards RS-330A and RS-343A.

MILITARY . . Sync which does not include equalizing pulses or serrations, has no horizontal front porch, and no horizontal rate pulse information during the vertical front porch of three scan line duration.

Pulse widths are adjustable so the waveform can be matched exactly to the desired operating format. Vertical pulse proportions must be synchronous with the horizontal scan lines, and therefore are adjustable but locked to horizontal information to prevent apparent drift or jitter in the display. All pulse widths and pattern proportions should be adjusted as required for the rate to be used.

Procedure to Change Scan Rate (See Table I)

1. Insert the crystal of proper frequency (determined in step 3) into the proper location on the QUAD RATE MASTER OSCILLATOR/BLANK circuit card (see drawing L-2149). This drawing shows the scan rate related to each crystal, and the calibration normally provided for that rate in a "standard" instrument.

2. Install the required programming diodes on MULTIRATE COUNT SELECT circuit cards per drawing L-2037 to count the number of t.v. lines per field, plus width of the V Drive and V Blanking pulses. There are group listings of drawings for this card, with diodes selected as shown for typical scan rates on the Parts List PL-2037 at the rear of this manual. Insertion of a diode will remove a count. For instance, the width of Vertical Blanking normally is 20 t.v. lines for the 525/60 scan rate. Diodes are not installed at positions CR57, Group 10, (Count 16) and CR41, Group 9 (Count 4), but all other positions for this function (CR40, CR25, CR24, CR9 in Group 9, and CR56 in Group 10) leaving a count of 16 + 4 = 20. Should it be desired to increase the pulse width to 22, merely remove the diode at position CR24, Group 9, to add the Count 2. Note that the total count for the number of scan lines per field, width of V Drive, or width of V Blanking will be a binary sum. That is:

   - for the 525-line rate, 2:1 interlace, the count per field is 262.5 (= 256 + 4 + 2 + 0.5 Reset internal).
   - for 1080-line rate, 1:1 interlace, the count per field is 540 (= 512 + 16 + 8 + 2 + 1 + 0.5 + 0.5 Reset internal).

   - or -

   this rate could be specified as 540-line, 1:1 interlace, describing the lines per field rather than lines per frame. The count would be the same.

   - a V Blanking width of 33 lines would be obtained by a count of (32 + 1 = 33).
   - a V Drive width of 10.5 lines would be obtained by a count of (8 + 2 + 0.5 = 10.5).

   Table I, page 36, shows the counts normally used for the "standard" scanning rates of 525/60, 875/60, 945/60 and 1029/60. Install or remove diodes as necessary to obtain the proper count for the number of horizontal t.v. lines per field, width of V Blanking and width of V Drive. Note that the count select circuit cards have capability for selection of parameters for as many as eight scan rates; only four rates are used in this instrument.

3. Adjust the horizontal rate pulses to the desired width:

H Blanking	H Sync
H Drive	2H Serrations
H Front Porch	2H Equalizing

These adjustments should be made while observing the Sync signal in the Broadcast mode, even though this mode is not to be used. If no specification is given for the 2H Serration and Equalizing pulses for the scan rate being used, adjust them as shown for the 525/60 and 875/60 rates (Table I) for the Lo and Hi modes. In "standard" instruments, there are two modes of horizontal rate pulse widths. The Lo mode normally is selected by Scan Rates A and B (525/60 and 625/50) and the Hi mode by all other rates. If this instrument has been modified for other rates, check which mode has been provided for each rate.

CALIBRATION RANGES

Vii television test instruments have been configured for the scanning rate in prevalent use at the present time. Control and calibration ranges have been selected, therefore, to cover timing as appropriate for rates from 625/50 to 1225/60. That is, horizontal pulse and pattern control ranges are selected for total horizontal line times of from 70 microseconds to 25 microseconds, and vertical control ranges are selected to cover both 50 Hz and 60 Hz field rates, the ones in common use for 2:1 interlaced systems. Therefore instruments can be calibrated for conformance to all EIA standard rates as shown in Table I, plus other rates that fall within these timing ranges.

Vii has developed a Proportional pulse standard in which all pulse widths are expressed as a percentage of total horizontal line time. This format, as detailed in Table I, conforms to EIA Standards RS-170 and RS-330, but not exactly to horizontal pulse widths set forth in EIA Standard RS-343. This format is recommended for all rates, even those higher than 1225/60. Note that clocked instruments are not adjustable and cannot deviate from the standardized proportion.

Operation at rates lower than 525/60, higher than 1225/60, and at field rates far removed from 50 or 60 Hz is a special consideration. The test instruments are operable at higher rates; however, there is no precedent for calibration at these rates. Pulse widths as outlined in EIA Standard RS-343 are not appropriate, as a very large percentage of horizontal line time would be lost in blanking. Also there is a limit to the control range which can be provided reasonably. In view of this, Vii policy is:

a. Instruments will be calibrated to the customer's specification without extra charge for rates that fall within the scope of control ranges for "standard" scan rates outlined in Table I.

b. Calibration to rates outside this category is considered SPECIAL, most likely involving component change and other instrument modification. This includes both slower and faster rates. Extra charges may be in order.

c. Control ranges cannot be extended for coverage of widely diverse rates. A control range ratio of 3 to 1 is considered a reasonable limit for equipment of this type (e.g. to cover horizontal scan line times of 66 usec. to 22 usec.). Beyond this potentiometer control becomes difficult to set and stability is lessened. The totally clocked systems do not face such severe limitations for horizontal proportions.

TABLE I

Vii "Standard" Scan Rates - Proportional Format

SYNC GENERATOR CHARACTERISTICS - 2:1 INTERLACE									
Rate -									
Lines per Frame	525	675	729	875	945	1023	1029	1225	625
Lines per Field	262.5	337.5	364.5	437.5	472.5	511.5	514.5	612.5	312.5
Field Rate	60	60	60	60	60	60	60	60	50
H Rep Rate - kHz	15.750	20.250	21.870	26.250	28.350	30.690	30.870	36.750	15.625
Total H Line - usec	63.5	49.4	45.7	38.1	35.3	32.6	32.4	27.2	64.0
Active H Line - usec	52.4	40.8	37.7	31.4	29.1	26.9	26.7	22.4	52.8
Typical Pulse Widths									
4% V Drive T.V.LINES	10.5	13.5	14.5	17.5	19.0	20.5	20.5	24.5	12.5
V Front Porch "	3	3	3	3	3	3	3	3	3
V Sync "	3	3	3	3	3	3	3	3	3
V Post "	3	3	3	3	3	3	3	3	3
7.5% V Blanking "	20	25	27	33	35	38	39	46	23
17.5% H Blank USEC	11.1	8.6	8.0	6.7	6.2	5.7	5.7	4.78	11.2
10% H Drive "	6.4	4.9	4.6	3.8	3.5	3.3	3.2	2.7	6.4
2.5% H Fr Porch "	1.59	1.24	1.14	0.95	0.88	0.82	0.81	0.68	1.60
7.5% H Sync "	4.76	3.71	3.43	2.86	2.65	2.45	2.43	2.04	4.80
3.75% 2H Equal "	2.38	1.85	1.71	1.43	1.32	1.22	1.22	1.02	2.40
7.5% 2H Serr "	4.76	3.71	3.43	2.86	2.65	2.45	2.43	2.04	4.80

NOTE: Pulse Widths and Rates conform to EIA Standards RS-170 and RS-330.
V Blanking nominal pulse width = 1250 usec at all 60 Hz field rates, nominal 1500 usec. for 50 Hz field rates.
V Drive nominal pulse width = 667 usec at all 60 Hz field rates, nominal 800 usec. for 50 Hz field rates.

TABLE II

EIA Standard Scan Rates

SYNC GENERATOR CHARACTERISTICS - 2:1 INTERLACE									
Rate -									
Lines per Frame	525	675	729	875	945	1023	1029	1225	625
Lines per Field	262.5	337.5	364.5	437.5	472.5	511.5	514.5	612.5	312.5
Field Rate	60	60	60	60	60	60	60	60	50
H Rep Rate - kHz	15.750	20.250	21.870	26.250	28.350	30.690	30.870	36.750	15.625
Total H Line - usec	63.5	49.4	45.7	38.0	35.3	32.6	32.4	27.2	64.0
Active H Line - usec	52.5	42.4	38.7	31.0	28.3	25.6	25.4	20.2	53.0
Typical Pulse Widths									
V Drive T.V.LINES	10.5	13.5	14.5	17.5	18.5	20.5	20.5	24.5	10.5
V Front Porch "	3	3	3	3	3	3	3	3	3
V Sync "	3	3	3	3	3	3	3	3	3
V Post "	3	3	3	3	3	3	3	3	3
V Blanking "	20	26	28	33	36	39	39	46	20
H Blanking USEC	11.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	11.0
H Drive "	6.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	6.4
H Front Porch "	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5
H Sync "	4.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	4.75
2H Equalizing "	2.35	1.4	1.4	1.4	1.4	1.4	1.4	1.4	2.35
2H Serrations "	4.50	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.50

NOTE: Pulse Widths and Rates conform to applicable EIA Standards RS-170, RS-330, RS-343 and RS-375.
V Blanking nominal pulse width = 1250 usec. at all rates.
V Drive nominal pulse width = 667 usec. at all rates.

d. While instruments can operate at quite high rates (including up to 65 kHz horizontal scan) the video signal is limited in maximum repetition rate and rise/fall times. These limitations prevail regardless of horizontal rate.

e. Units require that a master oscillator crystal of proper frequency, as well as proper card programming for scan rate count, be installed for rate desired.

Please contact the factory should further information be desired.

PERFORMANCE VERIFICATION AND CALIBRATION

Sync Source Generators operate automatically, developing an analog television signal through digital techniques. Therefore, no extensive calibration is required, unless component replacement is undertaken. Internal controls are provided for horizontal rate pulse widths. These are to be adjusted as desired for the particular application of the equipment and should be checked if any components in the cards are replaced. Also, their values should be adjusted if another card is inserted into the unit.

Vertical timing is controlled by counter circuits and, therefore, is automatically locked to the horizontal rate. Pulse proportions can be adjusted by internal programming modification, as described under SCAN RATE CHANGE AND SYNC FORMAT.

Steps to be completed for calibration are marked by an asterisk (*); these steps do not need to be considered for performance verification only.

Equipment

1. Any good, general purpose oscilloscope with adequate high frequency response is suitable for inspection of the waveforms. Calibration of the Sync Source 1303A requires an oscilloscope response that is flat (±0.5 db) to greater than 30 mHz to show complete detail of risetime. Direct coupling (d.c.) is preferred to prevent false appearance of a tilt on the video waveform at vertical rate. The oscilloscope should have provisions for external synchronization from either horizontal or vertical drive to view the composite video output waveform with convenience. Also, a delaying sweep capability will permit inspection of selected horizontal lines within the vertical television field. Typical instrumentation suited for this use would be the Tektronix Type 475 or equivalent.

2. A television monitor capable of displaying the test signal such as Conrac Model RQA (monochrome) or Model 7211 (RGB color).

3. A UG-274/U BNC series coaxial cable tee and 75 ohm termination, Dage 540-2 or equivalent.

4. A minimum of two coaxial cables, RG59B/U, no more than three feet in length with BNC connectors.

5. An accurate voltmeter, ±1% accuracy at least 10,000 ohms per volt impedance, 0 - 10v. range.

6. A frequency counter capable of indicating horizontal and vertical repetition rates, such as the Fluke Model 1900A or equivalent. If available, a counter with dual inputs and the capability for external clocking, such as the Monsanto Counter-Timer, Model 100B will be useful.

Tolerances have not been standardized in the television industry and often vary according to particular system requirements. Therefore adjustments called out herein are described without specific tolerance range. Pulse width settings are observed upon an oscilloscope display, in which close setting is a matter of technician care in procedure. In factory calibration a tolerance of ±5% is assumed as a maximum allowance on all oscilloscope measurements, i.e. a pulse width of 10 usec. must be within ±0.5 usec. to be considered acceptable. The horizontal scan rate is derived from a crystal oscillator in which case a repetition rate tolerance of 0.01% can be assumed unless specified otherwise.

Voltage Levels

* Power supply levels must be verified prior to calibration (+12v., +5v., +8v., and -5v.) to establish proper reference levels for all operations. Test points are provided on the POWER REGULATOR card to check the voltage levels. A control is provided at the right side of the POWER REGULATOR card to adjust the +5v. supply. Others are not adjustable. Then proceed to the itemized procedure as listed on the following page.

Calibration Procedure

Vertical timing is controlled by the counter circuits, and therefore is automatically locked to the horizontal rate. Pulse proportions can be adjusted by internal wiring modification; refer to SCAN RATE CHANGE AND SYNC FORMAT section if such adjustment is desired. All horizontal proportions are adjustable and may be set to the exact pulse width desired for particular application. Controls are provided on the QUAD RATE MONO circuit cards for calibration of horizontal rate pulse widths for each scan rate. Examples are given using 525/60 for Scan Rate A, 625/50 for Scan Rate B, and 875/60 for Scan Rate C. Of course values for actual format and rates in use should be substituted.

Calibrated Mode A - 525/60 Scan Rate

1. Select Scan Rate A at the front panel.

2. Refer to Table I, page 36, for proper timing relationships for the 525-line scan rate. See Figures 3 and 4 for conformance to typical waveforms.

3. Sync the oscilloscope from the leading edge (-) of H Drive. Set oscilloscope sweep rate as desired for inspection of timing as described in each step of adjustment.

4. Observe the H Drive waveform at the rear panel. Pulses should be 8 volts, pk-pk (unterminated) negative going with leading edges spaced as shown in Table I for the various scan rates (63.5 usec. at the 525-line rate). The pulse width should be 10% of the total line time (6.4 usec. at the 525-line rate).

5.* The Video format output synchronizing pulse amplitude should be adjustable over a nominal range of 3.5v. to 4.5v. peak-to-peak when outputs are properly terminated. Adjust the output pulse amplitude as desired, usually to 4.0v. pk-pk using the control at the right edge of the PULSE OUTPUT (Position 9A) circuit card. Note that this control provides simultaneous adjustment to all four outputs: H drive, V drive, blanking and sync.

6.* Adjust the H drive pulse width to the proper value by use of the control at the right side of the QUAD RATE MONO/H DRIVE card, Position 16A.

7. Sync the oscilloscope from the leading edge (-) of V Drive. Set oscilloscope sweep to 2 msec. per division. Observe the V Drive waveform.

   The V Drive pulses should be spaced 16,667 usec. apart, occurring at a 60 Hz rep rate. Switch oscilloscope sync to LINE; the pattern should either be stationary or drift very slowly to the right or left. A rapid travel or apparently out of sync signal indicates that the vertical rate is incorrect, due to improper master oscillator frequency or improper line count. Note that this test cannot be made for rates not developing a 60 Hz field, such as the 625/50 rate, where the field rep rate is not the same as the power line frequency. Return oscilloscope sync to V Drive.

8. Observe the Blanking output, with oscilloscope sync at H Drive. Observe amplitude, polarity and leading edge spacing to be as described previously. Check H Blanking pulse width, usually 11.1 usec. for the 525/60 scan rate.

9.* Adjust H blanking pulse width by use of the control at the right side of the QUAD RATE MONO/H BLANK card, Position 17A.

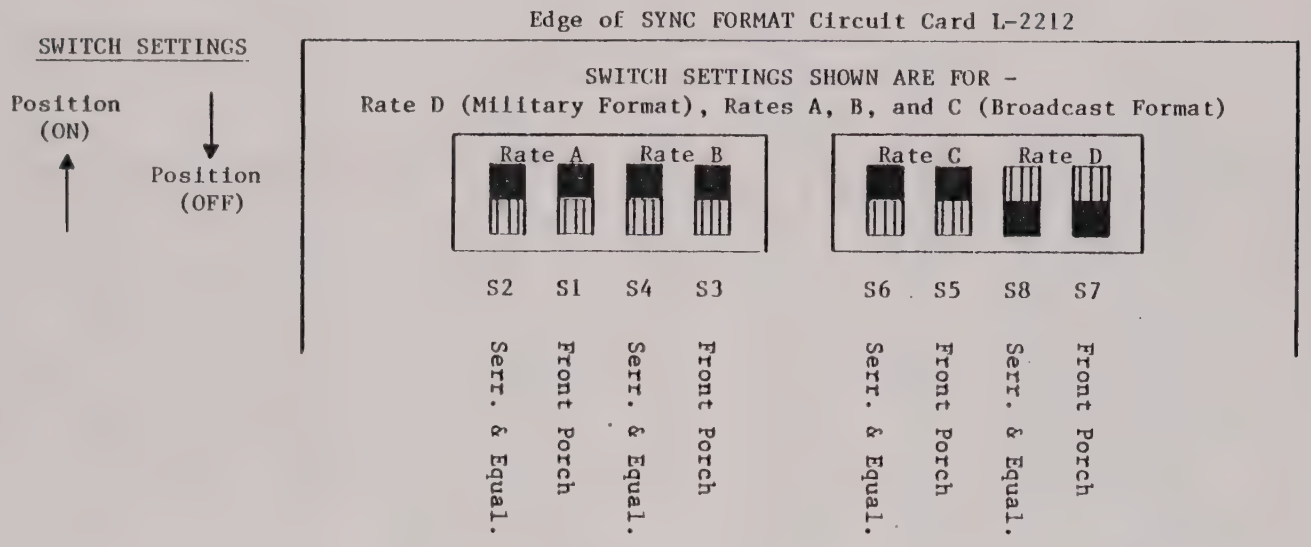
10. Sync oscilloscope to the leading edge (-) of V Drive. Set oscilloscope sweep at 2 msec/div. Select the BROADCAST format.

    Observe the Sync output and inspect for proper vertical sync waveform using either expanded or delayed sweep. The sync waveform may be presented in any one of three formats (as described on page 32 and illustrated in Figure 4) by selection on the SYNC FORMAT (Position 10) circuit card. Refer to Table III (page 43) for switch settings.

    The BROADCAST format is supplied in the NTSC convention, in which there will be six equalizing pulses before the vertical sync pulse, six serrations in the vertical sync pulse, and six equalizing pulses after the vertical sync pulse. In other formats in which there are no equalizing pulses and serrations, there will be three horizontal line interval widths as shown in Figure 4.

    If using the BROADCAST format, note presence of six positive serrations in the V sync interval (from 3H to 6H past V drive leading edge, from 191 usec. to 382 usec. at 525-line rate). It may be necessary to expand the sweep for this observation; delaying sweep at approximately 50 usec/div. will also permit convenient viewing of the V sync interval. Six serration pulses should be present in the V sync interval (occurring at 2H rate). Observe that six equalizing pulses are present before and after the V sync interval, also at 2H rate. Do not adjust pulse widths at this time.

TABLE III - SYNC FORMAT SELECTOR SWITCH SETTINGS



		SWITCH POSITIONS		
		BROADCAST	INDUSTRIAL	MILITARY
RATE A . .	S1/S2	OFF/OFF	OFF/ON	ON/ON
RATE B . .	S3/S4	OFF/OFF	OFF/ON	ON/ON
RATE C . .	S5/S6	OFF/OFF	OFF/ON	ON/ON
RATE D . .	S7/S8	OFF/OFF	OFF/ON	ON/ON

Select the INDUSTRIAL format. The serrations and equalizing pulses should disappear, leaving the waveform as shown in Figure 4.

Select the MILITARY format. The waveform should appear as shown in Figure 4. There should be no horizontal rate pulses in the three line spacing preceding vertical sync. The horizontal sync pulses should shift to the left slightly, as there is no front porch for this format.

Select the BROADCAST format before proceeding to the next step.

11. Continue to observe the Sync output. Sync oscilloscope from the leading edge (-) of H Drive, sweeping scope at a convenient rate to show the H sync pulses.

12. The serrations will appear as a faint trace of positive pulse half way between the H sync pulses, usually 4.76 usec. wide for the 525/60 scan rate. The trailing edge of this pulse is coincident with the leading edge of H sync.

13.* Adjust the serrations control at the right side of the QUAD RATE MONO/2H SERRATIONS card, Position 12A, for proper serration pulse width.

NOTE: Gross misadjustment can cause an apparent loss of horizontal front porch, particularly if the front porch adjustment is longer than serration timing. Should this occur, adjust the Front Porch control to minimum and Serration control to maximum pulse lengths. Front porch should then appear; complete adjustments in manner described on the following page.

14. Observe the sync pulse, noting the width of front porch delay (usually 1.59 usec. for the 525/60 scan rate) and width of the horizontal sync pulse (usually 4.76 usec. for the 525/60 scan rate). Equalizing pulses will appear as a faint trace inside the H sync pulse outline usually 2.38 usec. wide for the 525/60 scan rate.

15.* Adjust the front porch (leading edge delay) by use of the control at the right side of the QUAD RATE MONO/2H FRONT PORCH card, Position 14A. Adjust the width of the H sync pulse by use of the control at the right side of the QUAD RATE MONO/H SYNC card, Position 15A. Adjust equalizing pulse width by use of the control at the right side of the QUAD RATE MONO/2H EQUALIZING card, Position 13A.

16. The optional TTL format V Drive, Blanking and Sync pulse outputs are identical in pulse width and spacing to the Video format outputs, but are direct coupled, have a fixed output level of 1.8v. terminated and 3.6v. unterminated, and have an output impedance of 75 ohms. Connect each output to the oscilloscope to verify pulse shape and level, with polarity (positive or negative pulse) as selected at the rear panel. Note that the TTL driver circuit does not produce as precise a waveform as the Video format; some crosstalk between channels is evident in the unloaded outputs. The outputs will appear much cleaner when loaded by a terminating resistor. Pulse polarity is selectable by the slide switch next to the connector on the rear panel.

17. This completes calibration at the 525/60 scan rate.

Calibrated Mode B - 625/50 Scan Rate

1. Select Scan Rate B at the front panel.

2. Refer to Table I, page 36, for proper timing relationships for the 625-line scan rate. See Figures 3 and 4 for conformance to typical waveforms.

3. Follow the procedure as outlined for the 525/60 line rate, Steps 3 through 16. Note that all adjustments will be made using the control second from right on the QUAD RATE MONO circuit cards. Timing should be set as appropriate for the scan rate in use.

   Note that the drift test (Step 7 of the 525/60 scan rate calibration procedure) cannot be made for rates not developing a 60 Hz field, such as the 625/50 rate, where the field rep rate is not the same as the power line frequency.

4. This completes calibration of Calibrated Mode B.

Calibrated Mode C - 875/60 Scan Rate

1. Select Scan Rate C at the front panel.

2. Refer to Table I, page 36, for proper timing relationships for the 875/60 scan rate. See Figures 3 and 4 for conformance to typical waveforms.

3. Follow the procedure as outlined for Calibrated Mode A, Steps 3 through 16. Note that all adjustments will be made using the controls third from right on the QUAD RATE MONO circuit cards. Timing should be set as appropriate for the scan rate in use.

4. This completes calibration of Calibrated Mode C.

Calibrated Mode D

1. Select Scan Rate D at the front panel.

2. Refer to Table I, page 36, for proper timing relationships for scan rate in use. See Figures 3 and 4 for conformance to typical waveforms.

3. Follow the procedure as outlined for Calibrated Mode A, Steps 3 through 16. Note that all adjustments will be made using the controls fourth from right on the QUAD RATE MONO circuit cards. Timing should be set as appropriate for the scan rate in use.

4. This completes calibration of Calibrated Mode D.

CALIBRATION CHECKLIST
Sync Source 1303A

FUNCTION	RATE A ✓	RATE B ✓	RATE C ✓	RATE D ✓	REMARKS
H Drive Width					
Pulse Amplitude					
V Drive Width					
H Blanking Width					
V Blanking Width					
Sync Format:					
Broadcast - NTSC					
Industrial					
Military					
Serration Width					
Front Porch Width					
H Sync Width					
Equalizing Width					
TTL Pulse Level (opt.) . .					
Interlace (opt.)					

TROUBLESHOOTING

This Sync Generator has been designed to provide the greatest reliability possible in the normal laboratory environment. Unfortunately some components, particularly capacitors and semiconductors, exhibit a limited lifetime, and lead to the possibility of component failure. In this instrument the components are derated to assure the longest possible lifetime; proper operation should be expected for at least a five year and probably ten year period.

Be sure to check the calibration procedure to establish that failure has occurred definitely. Often a symptom of difficulty can be traced to improper adjustment of the unit.

Failures which would occur relatively early, within one to two years, are most likely due to semiconductor (transistor) failure due to internal contamination at the time of manufacture or due to defective solder joints in assembly. Failures occurring at later times statistically would be attributed to electrolytic capacitor failure due to internal chemical reaction.

In rare instances, there may appear in this equipment a deviation from the part as called out on the schematic and in the parts list. This is especially true in the case of semiconductor devices, diodes and transistors, where a number of types are interchangeable. The right is reserved to make use of interchangeable components where such substitution will provide equal or superior performance to that specified. It is suggested that if replacements are required, the type specified in the parts list be procured.

You are urged to read the instruction manual completely before connecting the Signal Source Generator for operation. Observance of only a few procedures will provide greater operator convenience and will assure most effective application of the equipment as well as provide maximum safety to the user.

CAUTION

Even low voltages commonly present in transistorized circuits are potentially dangerous. Additionally, full line voltage is present on fuse terminals, power switch terminals, and other exposed points within the interior of the unit, and are accessible when the cover of the equipment is removed. Caution should be exercised, as follows:

a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.

b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).

c. Never work on electrical equipment when alone. Service and calibration should be attempted only by a qualified electronics technician.

Fault isolation can be achieved most efficiently by determining the circuit card module causing difficulty, from symptoms in the output waveforms.

Lack of proper output signal levels can usually be traced to problems in the power supply or related chassis problems, inproper termination, etc. Check that the output signals conform to typical waveforms. If there is a problem in one of these signals, troubleshoot the proper section. If there is a fault in the video and all sync pulses are normal, troubleshoot the test pattern section of the parent unit.

a. When power is applied, and the power switch is turned to the ON position, the pilot light should be lit. If it is not, check the fuse (located on the rear panel). If the pilot light is lit, check all internal d.c. power levels in the parent unit. If all waveforms are missing, check that the appropriate internal master oscillator (on the QUAD RATE MASTER OSCILLATOR/BLANK circuit card, Position 18A) is operating properly. Check operation of the H front porch monostable multivibrator on the QUAD RATE MONO/H FRONT PORCH card (Position 14A).

b. If pulse timing and format appear correct but output pulses are missing, amplitude is not proper, or a.c. ripple appears in all of the output waveforms, check the +12v. power supply in the parent unit and PULSE OUTPUT card output stages and pulse level control. If only one waveform is missing or has improper level, check the appropriate output section of the PULSE OUTPUT card (Position 9A).

c. If H drive is proper but V drive, blanking and sync are at improper vertical rate, check the vertical count programming and operation (MULTIRATE COUNT, Position 19A, and MULTIRATE COUNT SELECT, Positions 20A, 21A and 22A, circuit cards).

d. If H drive and/or horizontal rate blanking pulses are missing or occur at 2H rate, but V drive is proper, check the 2:1 count on the MULTIRATE SYNC COUNT, circuit card (Position 19A).

e. If the H drive or horizontal rate blanking pulses are of incorrect width, or erratic, check the QUAD RATE MONO/H DRIVE and H BLANKING circuit cards (Positions 16A and 17A).

f. If the V drive or vertical rate blanking pulses are improper but H drive and sync waveforms are normal, check circuitry on the QUAD RATE MASTER OSCILLATOR/ BLANK circuit card (Position 18A).

g. If only the blanking waveform is abnormal, but amplitude is correct, check mixing circuitry on the QUAD RATE MASTER OSCILLATOR/BLANK circuit card (Position 18A) and QUAD RATE MONO/H FRONT PORCH, 2H SERRATION and 2H EQUALIZING circuit cards (Positions 14A, 12A and 13A) which operate at a 2H rate.

h. If the sync waveform only is improper in format or timing but amplitude is proper, check circuitry on the MULTIRATE SYNC (Position 11A) and QUAD RATE MONO/ H FRONT PORCH (Position 14A), H SYNC (Position 15A), H DRIVE (Position 16A), and H BLANKING (Position 17A) circuit cards.

i. The pulse outputs are developed on the PULSE OUTPUT (Position 9A) card, which should be checked if pulse levels are not proper. The optional TTL level pulse outputs are developed on the TTL PULSE OUTPUT (Position 7A) card, which should be checked if these pulse levels are not correct.

LIMITED WARRANTY

Signal Source equipment is guaranteed to be free of defects in material and workmanship for a period of one year from date of shipment, when operated in accordance with the instructions and specifications provided. Such limited warrant is made in lieu of any other guarantee or warranty, expressed or implied, and is offered only to the original purchaser. If such defects are confirmed through our inspection, the product will be repaired or replaced, at our option, without charge to the purchaser for parts or for labor. This warranty does not cover damage which occurs in shipment or due to misuse or abuse of the apparatus, and is not applied to cables or decorative, stained or painted finishes.

Those requesting adjustment through the terms of this warranty are instructed to contact the factory for authorization to return the equipment before shipment. Items for which authorization is issued are to be sent prepaid.

Signal Source equipment is designed and constructed using the most effective and safest industrial practice known, and in accordance with printed and accepted practices for fabrication of industrial electronic equipment. Inasmuch as Visual Information Institute, Inc. has no control over the manner in which the equipment will be interconnected, the corporation cannot and does not assume any liability for circumstances or damages arising from use of this equipment.

This warranty does not apply to equipment which has been modified in any way to other than the original factory configuration.

CAUTION

When removing and replacing jumpers on printed circuit cards, do not overheat card and lift printed circuit card copper pads. Use a vacuum device to remove solder before existing jumper is removed. Jumper removal and replacement must be done by those experienced with printed circuit cards. Damage to printed circuit cards caused by improper methods will void the warranty.

ACCESSORIES AND SERVICE

The Signal Source equipment is designed for long, reliable service under adverse operating environments. It should require a minimum of maintenance or service if properly applied.

A number of accessories are available for extended operation of Signal Source equipment, including special housings, cables, etc. especially designed to suit unusual requirements. Special configurations of Signal Source generators are available for integration into existing or contemplated systems, such as units without cases, special accessory functions brought to the front panel, etc.

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To obtain a return authorization, or other information related to these services, contact:

VISUAL INFORMATION INSTITUTE, INC.
ATTN: SALES COORDINATOR
719 LOWER BELLBROOK ROAD
XENIA, OH 45385
Phone: (513) 376-4361

CIRCUIT DESCRIPTION

The Sync Source 1303A Quad Rate Sync Generator Accessory follows the fundamental pattern employed for such devices for some time. The traditional format is used to permit flexibility in application; the output pulses can be adjusted to operate at the nominal values called out by current standards. Also the one set of circuit cards is operable at all recommended scan rates without major circuit alteration. Therefore, the generator easily can be made to match any system to which it is applied.

The signals are synthesized through modern digital techniques; the generator circuits are completely transistorized, composed of multivibrators which employ high speed switching transistors. All power supplies are closely regulated to insure dependable, stable operation over wide variations in ambient conditions.

Power for the sync generator operation is taken from regulated supplies in the parent unit. D.C. levels of +12v., +5v., and -5v. are required.

The master oscillator operates at 200 times the horizontal rate; the clock rate is divided by 10 to 20H rate on the QUAD RATE MASTER OSCILLATOR/BLANK circuit card (S-2149), and by 10 again to twice horizontal (2H) rate on the MULTIRATE SYNC (S-2152) circuit card in order to provide interlace. The serrations and equalizing pulses are developed from this master timing reference, at the 2H rate. From this point, the master timing pulses are divided by the count on the MULTIRATE SYNC COUNT (S-2039) card to generate horizontal (H) and vertical (V) rate pulses.

Detailed Circuit Description

The master oscillator system on the QUAD RATE MASTER OSCILLATOR/BLANK cirucit card (S-2149) develops the 20H rate output to initiate various pulses required to assemble the required outputs. The card contains four identical crystal oscillator circuits, of which Z7D, Z9C, Z9D and Z10D are typical.

Normal gates Z9C, Z9D are connected with positive feedback through the network C13, C12, R22 and R23. Crystal X1 serves as a filter, dictating the frequency at which the circuit may oscillate. Gate Z7D serves as a control. When no voltage is applied to Pin V, transistor Q1 is not con-

ducting and therefore the input to Ƶ7D is high, forcing the output to a low state, inhibiting Ƶ9D from operation. At selection of Scan Rate A, voltage is applied to Pin V, saturating Q1. Thus Ƶ7D is inhibited; its output goes high, allowing Ƶ9D to conduct. Oscillation is allowed. The oscillator output is routed through isolating inverter Ƶ10D and then to decade counter Ƶ8. The 20H master oscillator is routed out of the card through transistor Q5.

The 20H master oscillator signal is routed to the 10:1 integrated circuit Ƶ5 on the MULTIRATE SYNC COUNT (S-2039) card, developing a 2H rate signal at switching transistor Q3.

All horizontal rate pulse widths are generated by the QUAD RATE MONO (S-2101) cards, which are identical except for timing capacitor and range control resistor values. The input pulse is routed through buffer stage Q9 to differentiating capacitor C3 and bias network R26 and R27. The positive spike thus generated is biased so that only the tip can conduct through injection diode CR1, thereby causing transistor Q10 to turn "on" to saturation. The negative transition at the collector of Q10 is transmitted through emitter follower Q11 to timing capacitor C4, and to the base of transistor Q13 which is forced to the "off" stage. The positive transition generated at the collector of Q13 is transmitted through bias network R32 and R33 to lock the circuit in this state. This condition remains until timing capacitor C4 charges to a level sufficient to turn Q13 "on" once again. The negative transition developed at the collector of Q13 is transmitted through the bias network R32 and R33 to the base of Q10, turning it "off". The circuit rests in that stable state until another positive trigger is injected through CR1.

The rate of charge for C4 is controlled by the resistor/transistor network R34, R35, R36 and Q12. The constant current through Q12 is determined by the value of R34 and the voltage at the base of Q12, allowing a linear charge ramp for C4. The pulse width range is determined by the control voltage attenuator R35, R36. The base voltage of Q12 has multirate preset controls (R4, R7, R20 and R22).

EIA Standard RS-170 requires that serrations of horizontal rate be produced during the vertical sync interval. Serration polarity is opposite that of the horizontal pulses to permit detection of the vertical sync. Therefore, the negative <u>trailing</u> edge of the serration pulses becomes a timing reference as opposed to the negative <u>leading</u> edge of the horizontal sync pulses. The clock pulses are routed to the QUAD RATE MONO/2H SERRATIONS card where the serration pulse width is produced. From this point on, the trailing edge of the serration pulse is used as timing references. However, the leading edge of blanking must take place previous to the timing reference. Therefore, the horizontal 2H master timing pulses are routed to the QUAD RATE MONO/H FRONT PORCH card, where a time delay is developed to generate the proper start of blanking. This establishes the width of horizontal front porch.

Horizontal blanking is required at 2H rate for development of a "stretched" vertical blanking pulse as described later. Therefore the pulse at 2H rate is used as a trigger for the QUAD RATE MONO/H BLANK circuit card.

The front porch pulses are developed at 2H rate on the QUAD RATE MONO/H FRONT PORCH card, and submitted to a 2:1 count on the MULTIRATE SYNC COUNT circuit card, Ƶ6B. Therefore a controlling H-rate pulse is developed for generation of H drive; these particular pulses are generated by individual monostable multivibrators on their respective QUAD RATE MONO circuit card.

The rate pulse from Ƶ6B on the MULTIRATE SYNC COUNT circuit card is routed to the QUAD RATE MONO/H DRIVE card for initiation of horizontal front porch pulses at horizontal rate.

The serration pulse trailing edge is used as a trigger for the QUAD RATE MONO/2H EQUALIZING card to initiate that pulse. The serration pulse also is routed to the MULTIRATE SYNC card (S-2152) for processing by gates Ƶ11A, Ƶ11B and Ƶ11C to be used as a trigger for the QUAD RATE MONO/H SYNC card. Processing inserts or removes the horizontal front porch as required by the selected sync waveform format. The 2H rate sync trigger is developed by gate Ƶ11C. If the front porch delay is to be inserted, the serration pulse is added to the sync trigger signal by gate Ƶ11C. If the input to gate Ƶ11A is at high level, forcing the output to Ƶ11B low at all times, action of Ƶ11B is blocked. This blocks the serration pulse causing the sync trigger to be advanced to the trailing edge of the front porch pulse, eliminating the delay.

Horizontal sync is required at 2H rate for development of a "stretched" vertical sync pulse as described later. Therefore the QUAD RATE MONO/H SYNC card develops 2H sync. This pulse is routed to the MULTIRATE SYNC card, Pin N, for processing.

The 2H rate front porch pulses are submitted to a counter which develops the vertical (V) rate. This circuit develops a V reset which acts as the trigger to generate vertical pulses which signify the end of a television field (two fields constitute a frame which is one complete presentation in the vertical dimension of the television raster). Programming diodes are located on the MULTIRATE COUNT SELECT (S-2037) circuit cards to determine the number of horizontal lines in the frame.

Vertical count selection is determined by selective feedback per scan rate selector switch setting. Outputs from the J-K flip-flop binary count stages on the MULTIRATE SYNC COUNT card (S-2039) are routed to inverter gates (Ƶ4D) then NAND gates (Ƶ3C) on the MULTIRATE COUNT SELECT cards (S-2037). The NAND gate second input is routed to a positive voltage through a resistor (R1) to make this input inoperative. Thus the pulse is routed through the NAND gate (Ƶ3C) to the Reset buss (Pin E). If the count is not to be used, the resistor (R1) is grounded through a diode (CR41), blocking the flow of pulses through the NAND gate (Ƶ3C). Thus selection of diode location determines which counts will be used for development of the vertical rate trigger pulse for each scan rate. Each MULTIRATE COUNT SELECT card has eight stages; three cards are used to allow use of up to eleven scan rate counts plus thirteen stages used to develop V blanking and V drive pulse widths.

The vertical rate blanking and drive pulses are developed on the QUAD RATE MASTER OSCILLATOR/BLANK (S-2149) circuit card. A vertical rate trigger is developed on the MULTIRATE SYNC (S-2152) card by monostable multivibrator Ƶ4 and submitted to bistable latches Ƶ2C and Ƶ2D through Pin K, starting a pulse at each of these bistable elements. The pulses are terminated by turn off triggers developed from the MULTIRATE COUNT SELECT cards and routed through inverters Ƶ1E and Ƶ1F. When the respective outputs go negative, bistables return to their original state. Pulse widths are determined by placement of programming diodes on the MULTIRATE COUNT SELECT cards as discussed below.

The counts thus selected are added at resistor R1 on the MULTIRATE COUNT SELECT card (S-2037). When all desired counts have accumulated, a transition is developed at R1 to trigger monostable Ƶ1. The pulse output from Ƶ1 is used to reset all J-K flip-flop stages (Ƶ2 through Ƶ6A, pins 2 and 6) to initial conditions, thus restarting the count sequence. The V drive pulse is routed out of the QUAD RATE MASTER OSCILLATOR/BLANK card (S-2149) through Pin C to the PULSE OUTPUT card (S-2003) for further processing.

V blanking includes a "pulse stretch" circuit to make the V blanking interval the same width for both fields of an interlaced raster. The input pulse is routed to type D flip-flop Ƶ2D, causing it to change state. Flip-flop output is transmitted to bistable Ƶ6A, Ƶ6B which has been forced to change state by V blanking, through gate Ƶ4B. Bistable output is routed to inverter Ƶ6D, holding Ƶ5B into the present state. When the input pulse ends, coincident in time with the leading edge of H blanking, Ƶ5B is taken "off hold". Therefore it will return to original condition when the next H blanking pulse trailing edge occurs, submitted to Ƶ5B

through Pin P and gate Z4A. The output of Z5B forces bistable Z6A, Z6B to return to original state, forming the "stretched" pulse. The output of Z6A is routed to mixer gate Z4C and inverter Z4D. The horizontal component of blanking is mixed with the vertical blanking pulse by NAND gate Z3C. The mixed blanking signal is routed through Pin D to the PULSE OUTPUT (S-2003) card.

"Sync" is a complex combination of H-rate and 2H-rate pulses, a mixture of H-sync, 2H equalizing pulses and 2H serration pulses. The leading edge of sync is positional with respect to the leading edge of blanking by the front porch pulse, if used.

Vertical sync is a pulse developed within the vertical blanking interval. The generator can produce the vertical sync interval to NTSC format. The NTSC format places the vertical sync interval delayed by three horizontal line intervals past the start of the V blanking interval. The vertical sync interval is three horizontal line lengths in width. Equalizing pulses at 2H rate, in groups of six for the NTSC (Broadcast) waveform are after the vertical sync pulse interval, and serrations at 2H rate, a group of six are inserted in the V sync pulse interval. Therefore, it is necessary to provide logic on the MULTIRATE SYNC (S-2152) card to produce the front porch delay and the vertical sync width. It is a further requirement that the vertical sync pulse be absolutely locked to the horizontal scanning rate. Therefore, counter pulses from the MULTIRATE SYNC COUNT (S-2039) card are used to control bistables which develop the vertical sync timing relationships.

Edges of the V sync pulse should be coincident with the edges of H sync. Therefore the pulses from the counter to select sync pulse widths are delayed by the serration pulse; gates Z1-A,B,C,D insert this delay prior to sync pulse logic.

Multiplexer Z1, Z2 allows selection of the input counts for the three-line NTSC waveform mode. Latch Z3D produces a three line pulse (Z8A), Z3B produces a six line pulse, and a pulse nine lines in length is produced by bistable Z3C. Gate Z6D combines the three line and six line pulses to one which extends from the third to sixth line in the vertical interval, the V sync pulse. Gate Z6C combines the nine line pulse with the V sync pulse to make two pulses, one from the start of the vertical interval to the third line, and another from the six to ninth lines; the pulse series is used to control the insertion of equalizing pulses before and after the V sync.

An apparent pulse irregularity is possible in the Industrial and Military formats; direct combination of the H sync and V sync pulses in an interlaced system produces V sync intervals of different length. Both the leading and trailing edge of V sync are clocked from the leading edge of H sync. Therefore the "even field" vertical sync appears lengthened by the H sync pulse. This irregularity, acceptable for the vast majority of applications, can be undesirable in some systems.

A "pulse stretch" network is included on the MULTIRATE SYNC circuit card to (S-2152) avoid such irregularities. The V sync pulse from Ƶ6D is routed to gate Ƶ7C through inverter Ƶ5E, initiating action in latch Ƶ3A. V sync also is routed to the "D" input of Ƶ8A, forcing Ƶ8A to change state and hold in that state. At the end of the V sync pulse, V sync returns to original condition, allowing Ƶ8A to operate. This operation occurs when the trailing edge of the next 2H rate sync pulse is transmitted through inverter Ƶ5A. The output of Ƶ8A is directed to Ƶ3A, changing the latch back to original state.

One complication arises, however. Pulse stretch is not allowable for the Broadcast mode. Therefore the equalizing pulse control voltage, at circuit card Pin D, is used to prevent operation of Ƶ3A.

The original and "stretched" V sync pulses are mixed at gate Ƶ7D. If the stretched pulse is not desired, pin 12 of gate Ƶ7D may be returned to +5v. rather than using the pulse output of Ƶ3A. The pulse is routed through filter R12, C3 and to inverter Ƶ7B.

The 2H sync pulse is routed to gate Ƶ6B where the rate is halved, producing H-rate pulses for use as a separate output and to be mixed into the composite sync signal.

All of these components - H sync, 2H equalizing pulses and 2H serrations - are combined into the sync waveform in one of three selectable formats:

a. Broadcast Waveform . . with equalizing pulses and serrerrations - H sync pulses are transmitted through gate Ƶ9C except from the first to ninth lines of the vertical interval, as determined by gate Ƶ9A. Equalizing pulses at 2H rate are introduced from the first to third and sixth to ninth lines through gate Ƶ6A which is controlled by gate Ƶ6C. Serrations at 2H rate are inserted from the third to sixth lines of the vertical interval by gate Ƶ9D, producing the Broadcast format.

b. Industrial Waveform . . without equalizing pulses and serrations - equalizing pulses are not permitted through gate Ƶ6A, which is turned off by inverter Ƶ10E, controlled by grounding the gate input at resistor R3 (Pin D). This also turns off inverter Ƶ10C and turns on Ƶ9A, deleting sync pulses from the third to sixth lines of the vertical interval, substituting h-rate sync pulses for the 2H equalizing pulses. Serrations are blocked from passing through gate Ƶ9D by the control level at R3, which inhibits inverter Ƶ10B. A vertical sync pulse without H or 2H rate information results, producing the Industrial format with or without a "stretched" vertical sync pulse.

c. Military Waveform . . The sync waveform used in certain systems requires that there be no H rate of 2H content in the vertical front porch and that there be no equalizing pulses and serrations as well as no horizontal front porch. Therefore, Pin E is grounded as in b., as is Pin D.

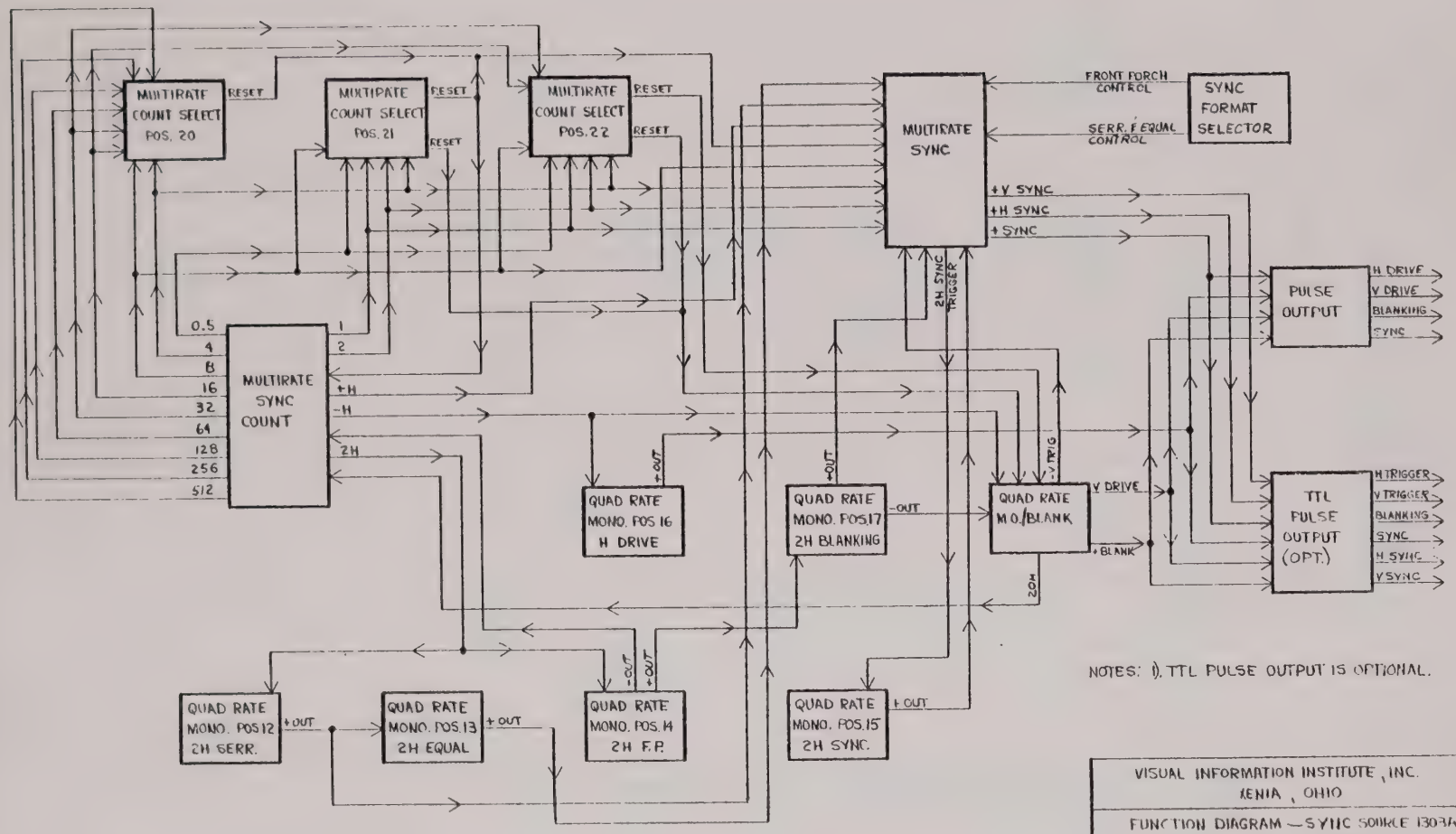
Sync format is controlled by switches on the SYNC FORMAT (S-2212) circuit card. Four separate sets of controls are provided, one for each selectable scan rate. Therefore the format may vary from one rate to another.

Sync generator outputs (H Drive, V Drive, Blanking and Sync) are processed through the PULSE OUTPUT (S-2003) circuit card to properly drive coaxial cable at the required amplitude and impedance. Four identical circuits are used. The input is routed through bias network R1, R2 to saturating stage Q1. The collector waveform from Q1 is routed to push-pull output drivers, Q2, Q3. Diodes CR1, CR2 between Q1 collector and load resistor R3 compensate for the base-to-emitter drop of the output drivers. Series resistors R4 and R5 provide a ground return path. The output is a.c. coupled through C1 to the output. Pulse amplitude must be controlled; control is obtained by the level of voltage directed to collector load R3, established by series regulator Q13, in turn controlled by potentiometer R25.

The operations described above are conducted in the sequence shown on the accompanying Function Diagram. A complete detailed schematic of individual circuit cards is included on the following page. Typical timing relationships for various scanning rates are shown on Table I.

SYNC SOURCE 1303A
QUAD RATE SYNC GENERATOR ACCESSORY
Schematic and Layout Drawing Index

No.	Description
S-3183	Function Diagram
PL-2118	TTL Pulse Output
L-2118	TTL Pulse Output (Group 5)
S-2118	TTL Pulse Output
PL-2003	Pulse Output
L-2003	Pulse Output (Group 1)
S-2003	Pulse Output
PL-2212	Sync Format
L-2212	Sync Format (Group 0)
S-2212	Sync Format
PL-2152	Multirate Sync
L-2152	Multirate Sync (Group 1)
S-2152	Multirate Sync
PL-2101	Quad Rate Mono
L-2101	Quad Rate Mono (Groups 12,13,14,15,16,17)
S-2101	Quad Rate Mono
PL-2149	Quad Rate Master Oscillator/Blank
L-2149	Quad Rate Master Oscillator/Blank (Group 1)
S-2149	Quad Rate Master Oscillator/Blank
PL-2039	Multirate Sync Count
L-2039	Multirate Sync Count (Group 0)
S-2039	Multirate Sync Count
PL-2037	Multirate Count Select
L-2037	Multirate Count Select (Groups 8, 9, 10)
S-2037	Multirate Count Select



NOTES: 1). TTL PULSE OUTPUT IS OPTIONAL.

VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
FUNCTION DIAGRAM — SYNC SOURCE 1303A QUAD RATE SYNC GENERATOR	
DRN D.L. WARNER	DATE 2-13-84
APP'D JH	DATE 3-1-84
REV.	DWG. NO. S-3183

TTL PULSE OUTPUT
PRINTED CIRCUIT BOARD ASSEMBLY

PARTS LIST PL-2118

ARTWORK REV. C (8/83) 4/26/84 SHT 1 OF 3

DESCRIPTION	VALUE/TYPE	QTY/GROUP 1	2	3	4	5	MFR.	Vii DWG. NO.
PCB ASSEMBLY		x	x	x	x	x	Vii	L-2118
PCB ARTWORK	CONDUCT SIDE	x	x	x	x	x	Vii	CB-2118
PCB ARTWORK	COMP. SIDE	x	x	x	x	x	Vii	CF-NONE
PCB SCHEMATIC		x	x	x	x	x	Vii	S-2118
Transistor	2N5134	6	4	6	4	6	BAS	A-1844
Resistor, Fixed	56 ohms	6	4	6	4	6	BAS	A-1450
"	1K ohms	21	12	25	16	19	BAS	A-1450
"	4.7K ohms	6	4	6	4	6	BAS	A-1450
"	10K ohms	6	4	6	4	6	BAS	A-1450
"	18K ohms	6	4	6	4	6	BAS	A-1450
Capacitor	0.1uf, 10v	8	5	8	5	8	BAS	A-1455
"	20uf, 12v	2	2	2	2	2	BAS	A-1458
I.C.	7403	3	2	3	2	3	BAS	A-1748
"	7404	3	2	3	2	3	BAS	
"	74128	2	1	2	1	2	BAS	
"	7428	x	x	x	x	x	BAS	
"	7433	x	x	x	x	x	BAS	
I.C. Socket	14 pin	8	5	8	5	8	BAS	A-1465
Bus Wire, Jumper	#24 Awg Sld	22	17	22	17	22	BAS	

TTL PULSE OUTPUT
PRINTED CIRCUIT BOARD ASSEMBLY

PARTS LIST PL-2118

ARTWORK REV. C (3/83) 4/26/84 SHT 2 OF 3

DESCRIPTION	VALUE/TYPE	QTY/GROUP 11	12	13	14	15	MFR.	Vii DWG. NO.
PCB ASSEMBLY		x	x	x	x	x	Vii	L-2118
PCB ARTWORK	CONDUCT SIDE	x	x	x	x	x	Vii	CB-2118
PCB ARTWORK	COMP. SIDE	x	x	x	x	x	Vii	CF-NONE
PCB SCHEMATIC		x	x	x	x	x	Vii	S-2118
Transistor	2N5134	6	4	6	4	6	BAS	A-1844
Resistor, Fixed	56 ohms	x	x	x	x	x	BAS	A-1450
"	1K ohms	21	12	25	16	19	BAS	A-1450
"	4.7K ohms	6	4	6	4	6	BAS	A-1450
"	10K ohms	x	x	x	x	x	BAS	A-1450
"	18K ohms	6	4	6	4	6	BAS	A-1450
Capacitor	0.1uf, 10v	8	5	8	5	8	BAS	A-1455
"	20uf, 12v	2	2	2	2	2	BAS	A-1458
I.C.	7403	3	2	3	2	3	BAS	A-1748
"	7404	3	2	3	2	3	BAS	
"	74128	x	x	x	x	x	BAS	
"	7428	2	1	2	1	2	BAS	
"	7433	x	x	x	x	x	BAS	
I.C. Socket	14 pin	8	5	8	5	8	BAS	A-1465
Bus Wire, Jumper	#24 Awg Sld	28	21	28	21	28	BAS	

TTL PULSE OUTPUT
PRINTED CIRCUIT BOARD ASSEMBLY

PARTS LIST PL-2118

ARTWORK REV. C (3/83) 4/26/84 SHT 3 OF 3

DESCRIPTION	VALUE/TYPE	QTY/GROUP 21	22	23	24	25	MFR.	Vii DWG. NO.
PCB ASSEMBLY		x	x	x	x	x	Vii	L-2118
PCB ARTWORK	CONDUCT SIDE	x	x	x	x	x	Vii	CB-2118
PCB ARTWORK	COMP. SIDE	x	x	x	x	x	Vii	CF-NONE
PCB SCHEMATIC		x	x	x	x	x	Vii	S-2118
Transistor	2N5134	6	4	6	4	6	BAS	A-1844
Resistor, Fixed	56 ohms	x	x	x	x	x	BAS	A-1450
"	1K ohms	21	12	25	16	19	BAS	A-1450
"	4.7K ohms	6	4	6	4	6	BAS	A-1450
"	10K ohms	x	x	x	x	x	BAS	A-1450
"	18K ohms	6	4	6	4	6	BAS	A-1450
Capacitor	0.1uf, 10v	8	5	8	5	8	BAS	A-1455
"	20uf, 12v	2	2	2	2	2	BAS	A-1458
I.C.	7403	3	2	3	2	3	BAS	A-1748
"	7404	3	2	3	2	3	BAS	
"	74128	x	x	x	x	x	BAS	
"	7428	x	x	x	x	x	BAS	
"	7433	2	1	2	1	2	BAS	
I.C. Socket	14 pin	8	5	8	5	8	BAS	A-1465
Bus Wire, Jumper	#24 Awg Sld	28	21	28	21	28	BAS	

Z5 AND Z8 SELECTION

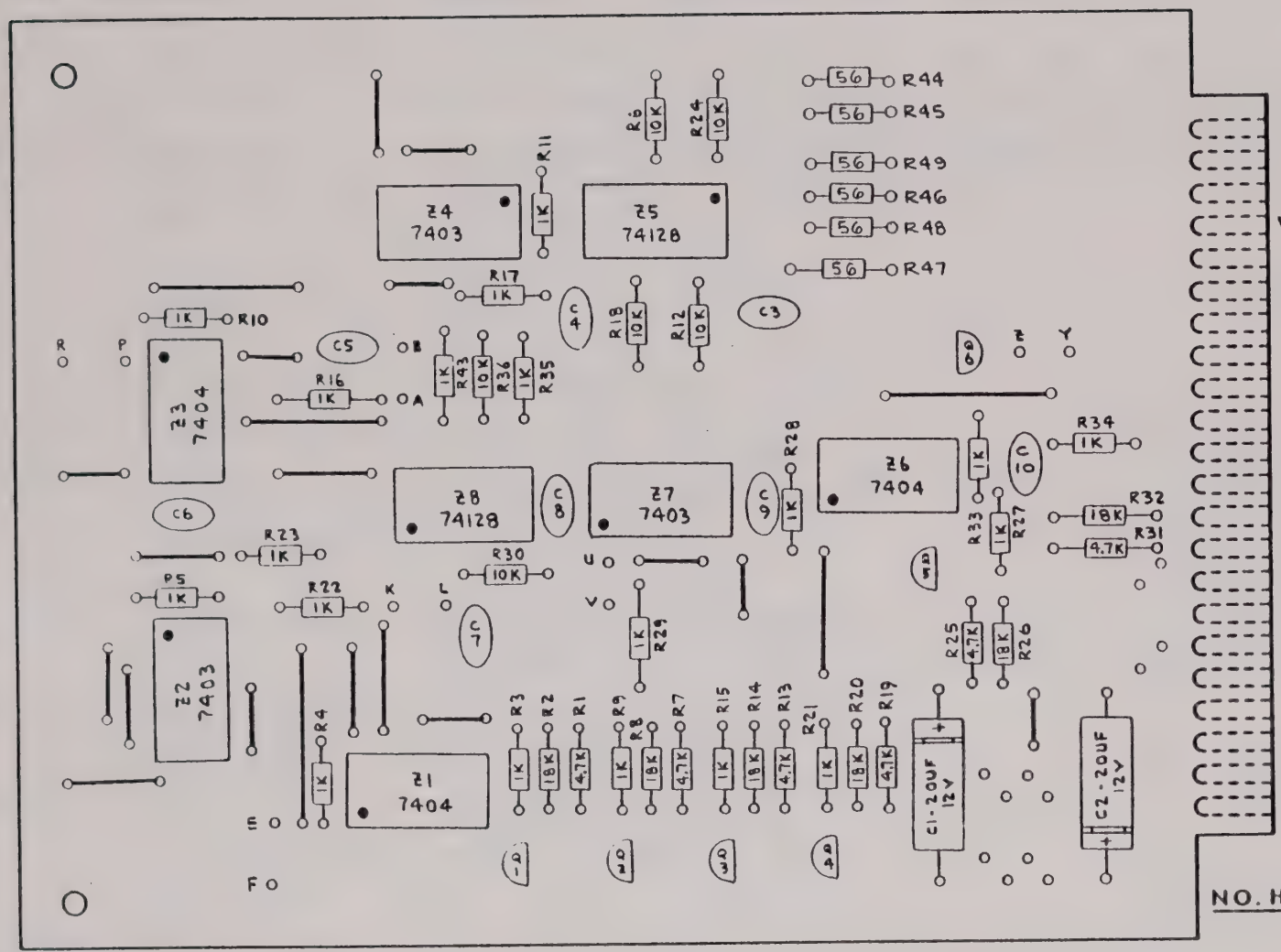
74128 . . . For line driver output which provides a 50 ohm source impedance.

7428 . . . For conventional TTL output.

7433 . . . For open collector output.

TTL PULSE OUTPUT 3-83 REV.C DWG. NO. L-2118 (GROUP 5)

PARTS LIST
4-26-84



Z V SYNC OUT
Y H SYNC OUT
X BLANKING OUT
W H TRIGGER OUT
V V TRIGGER OUT
U SYNC OUT
T BLANKING CONT. IN
S GRD
R V SYNC CONTROL IN
P V TRIG CONTROL IN
N SYNC CONTROL IN
M H TRIG CONTROL IN
L H SYNC CONTROL IN
K -5V
J +V SYNC IN
H +H SYNC IN
F +5V
E + SYNC IN
D + BLANKING IN
C +V TRIGGER IN
B +H TRIGGER IN
A - - -

NO. HOLES/BOARD = 280

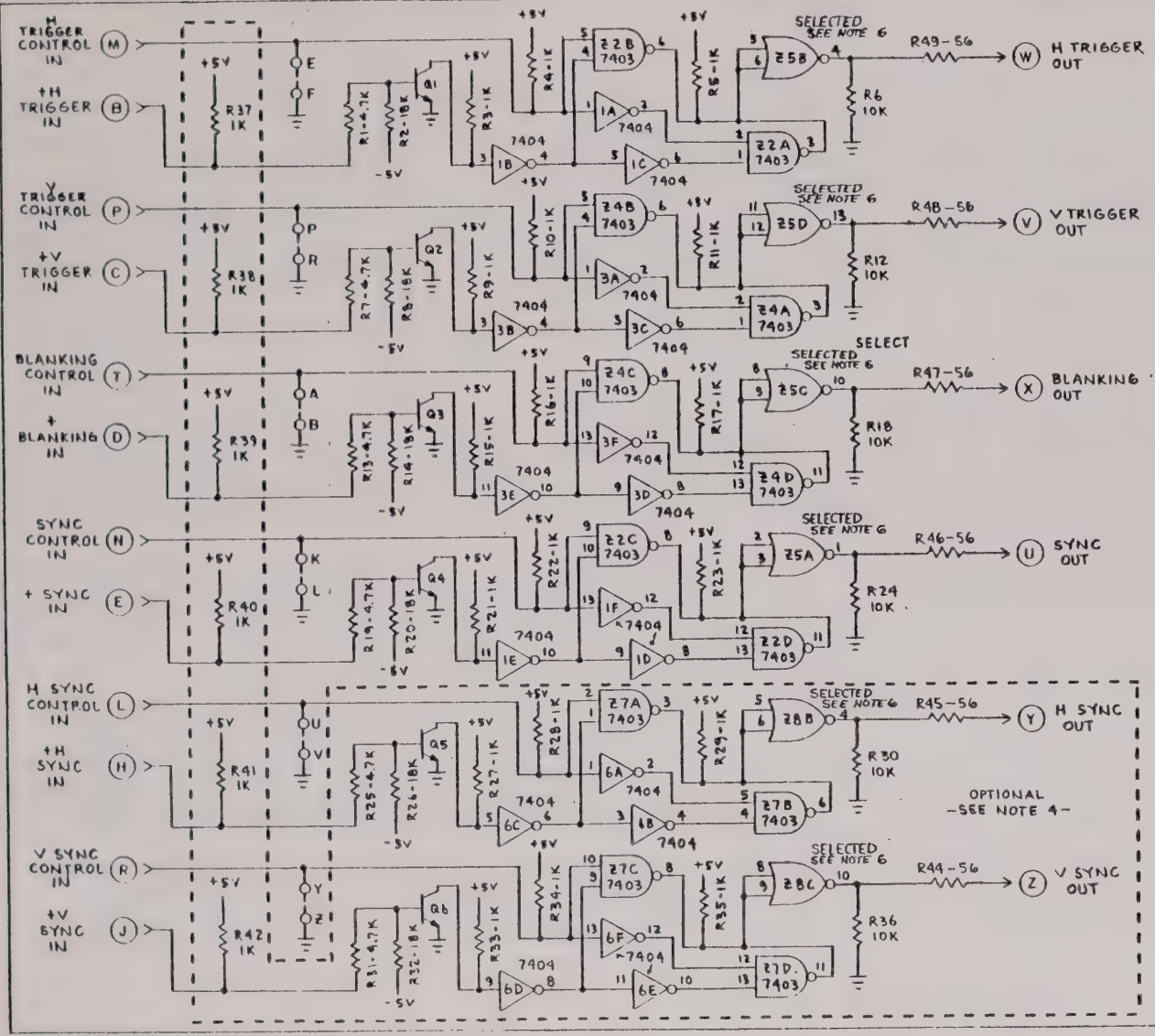
NOTES: 1) ALL TRANSISTORS = 2N5134.
2) ALL RESISTORS = 1/4W, ± 10% TOL.
3) C3 THRU C10 = 0.1UF, 10V.

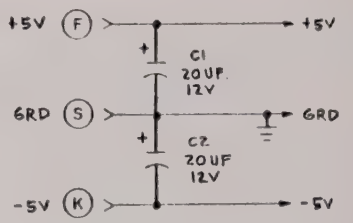
4) JUMPERS A-B, E-F, K-L, P-R, U-V, Y-Z ARE USED TO SELECT PROPER POLARITY OF OUTPUT PULSES:
JUMPER INSTALLED — NEGATIVE PULSES ONLY.
JUMPER NOT INSTALLED — POSITIVE PULSES OR REMOTE CONTROL.

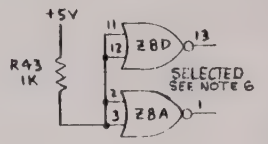
POSITION 7A L-2118 TTL PULSE OUTPUT OPTIONAL (Group 5)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	V SYNC OUT	[REAR PANEL, J16, V SYNC]
Y	H SYNC OUT	[REAR PANEL, J15, H SYNC]
X	BLANK OUT	[REAR PANEL, J13, BLANKING]
W	H TRIGGER OUT . .	[REAR PANEL, J11, H TRIGGER]
V	V TRIGGER OUT . .	[REAR PANEL, J12, V TRIGGER]
U	SYNC OUT	[REAR PANEL, J14, SYNC]
T	BLANK CONTROL . .	[REAR PANEL, J13, BLANKING]
S	GROUND	[GROUND BUSS]
R	V SYNC CONTROL . .	[REAR PANEL, S106, V SYNC]
P	V TRIGGER CONTROL.	[REAR PANEL, S102, V TRIGGER]
N	SYNC CONTROL . . .	[REAR PANEL, S104, SYNC]
M	H TRIGGER CONTROL.	[REAR PANEL, S101, H TRIGGER]
L	H SYNC CONTROL . .	[REAR PANEL, S105, H SYNC]
K	-5v.	[-5v. BUSS]
J	+V SYNC IN	[MULTIRATE SYNC, PIN R]
H	+H SYNC IN	[MULTIRATE SYNC, PIN P]
F	-5v.	[-5v. BUSS]
E	+SYNC IN	[PULSE OUTPUT, PIN E][MULTIRATE SYNC, PIN J]
D	+BLANK IN	[PULSE OUTPUT, PIN D][QUAD RATE MASTER OSCILLATOR/BLANK, PIN A]
C	+V TRIGGER IN . .	[PULSE OUTPUT, PIN C][QUAD RATE MASTER OSCILLATOR/BLANK, PIN C]
B	+H TRIGGER IN . .	[PULSE OUTPUT, PIN B][QUAD RATE MONO (16A), PIN A]
A	--	
	GROUND	[REAR PANEL, J16, GROUND LUG]







NOTES:
1) ALL TRANSISTORS = 2N5134.
2) ALL RESISTORS = 1/4W, ±10% TOL.
3) C3 THRU C10 = 0.1 UF, 10V. (NOT SHOWN).
4) FOR OPTIONAL PARTS, PER GROUP LISTING, RERER TO INDIVIDUAL GROUP ASS'Y. DW6S. L-2118 (GRP 1 THRU 25)
5) JUMPERS A-B, E-F, K-L, P-R, U-V, Y-Z ARE USED TO SELECT PROPER POLARITY OF OUTPUT PULSES:
   JUMPER INSTALLED – NEGATIVE PULSES ONLY
   JUMPER NOT INSTALLED – POSITIVE PULSES OR REMOTE CONTROL.
6) FOR Z5 & Z8 SELECTION SEE PL-2118 SHT. 3

VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
TTL PULSE OUTPUT	
DRN. PAT ANTONICK	DATE 1-22-82
APPV'L. K.R. Buttrey	DATE 2-11-82
P.C. ART REV. C (3-83)	DWG. NO. S-2118
REV. 4-26-84	

PARTS LIST for PULSE OUTPUT
PRINTED CIRCUIT BOARD ASSEMBLY

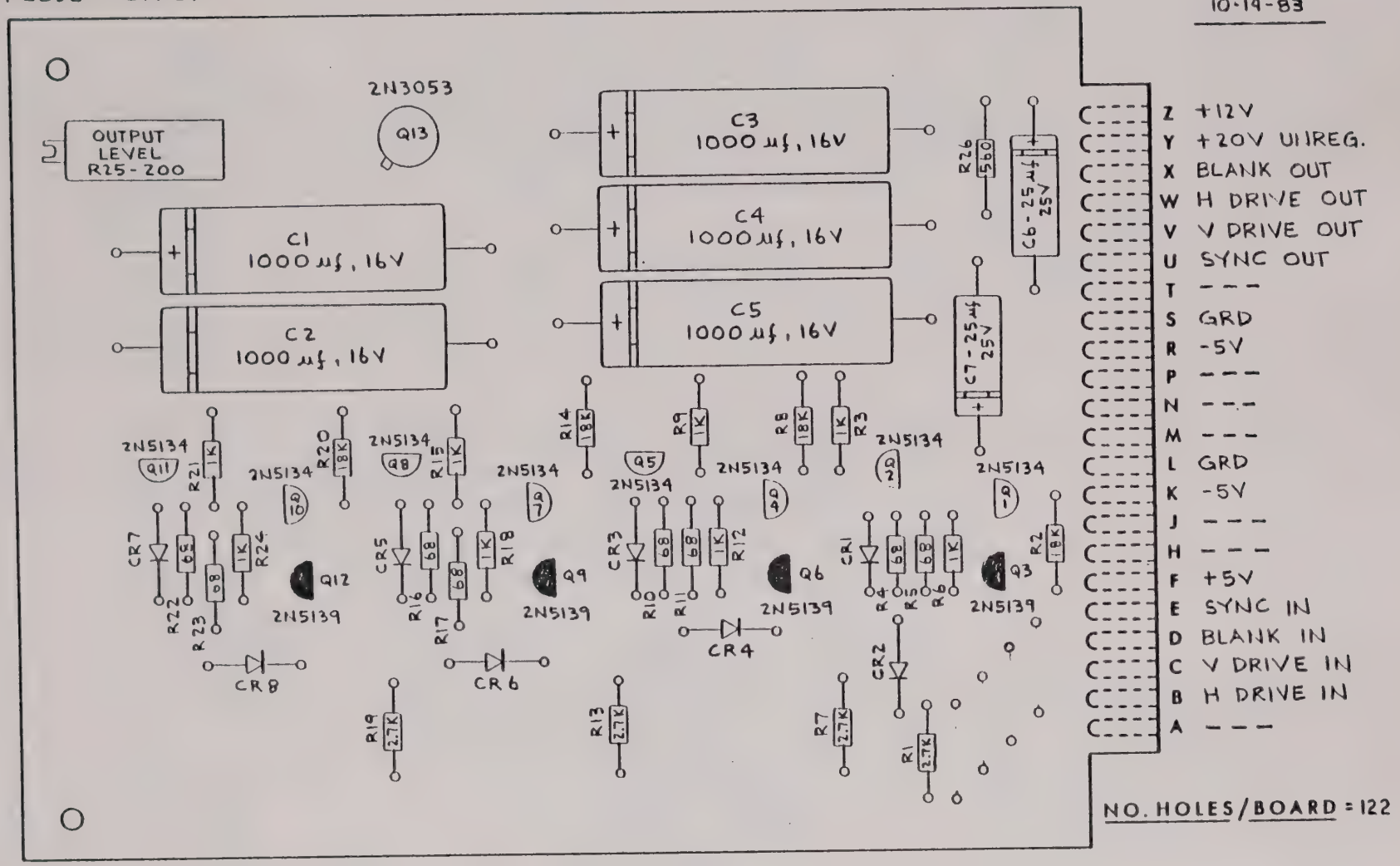
DATE 10-14-83
ARTWORK REV. D [11-80]

PL- 2003
SHT 1 of 1

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2003		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2003		
REF.	P. C. BOARD ARTWORK	COMP. SIZE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-NONE		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2003		
	DIODE	1N4154		8	8	8										BAS	A-1797		
	TRANSISTOR	2N3053		1	1	1											A-1834		
	TRANSISTOR	2N5134		8	8	8											A-1844		
	TRANSISTOR	2N5139		4	4	4											A-1845		
	RESISTOR, FIXED COMP.	68 OHMS		8	8	8											A-1450		
	↑ ↑ ↑	560 ↕		1	1	1													
		1K		8	12	8													
		2.7K		4	4	4													
	RESISTOR, FIXED COMP.	18K OHMS		4	4	4											A-1450		
	RESISTOR, FIXED COMP.	470 OHMS		X	X	4											A-1450		
	RESISTOR, VARIABLE	200 OHMS		1	1	1											A-1460		
	CAPACITOR	25 μF, 25V		2	2	2											A-1458		
	CAPACITOR	1000 μF, 16V		5	5	5										BAS	A-1459		

PULSE OUTPUT 11-80 REV. D DWG. NO. L-2003 (GROUP 1)

PARTS LIST
10-14-83



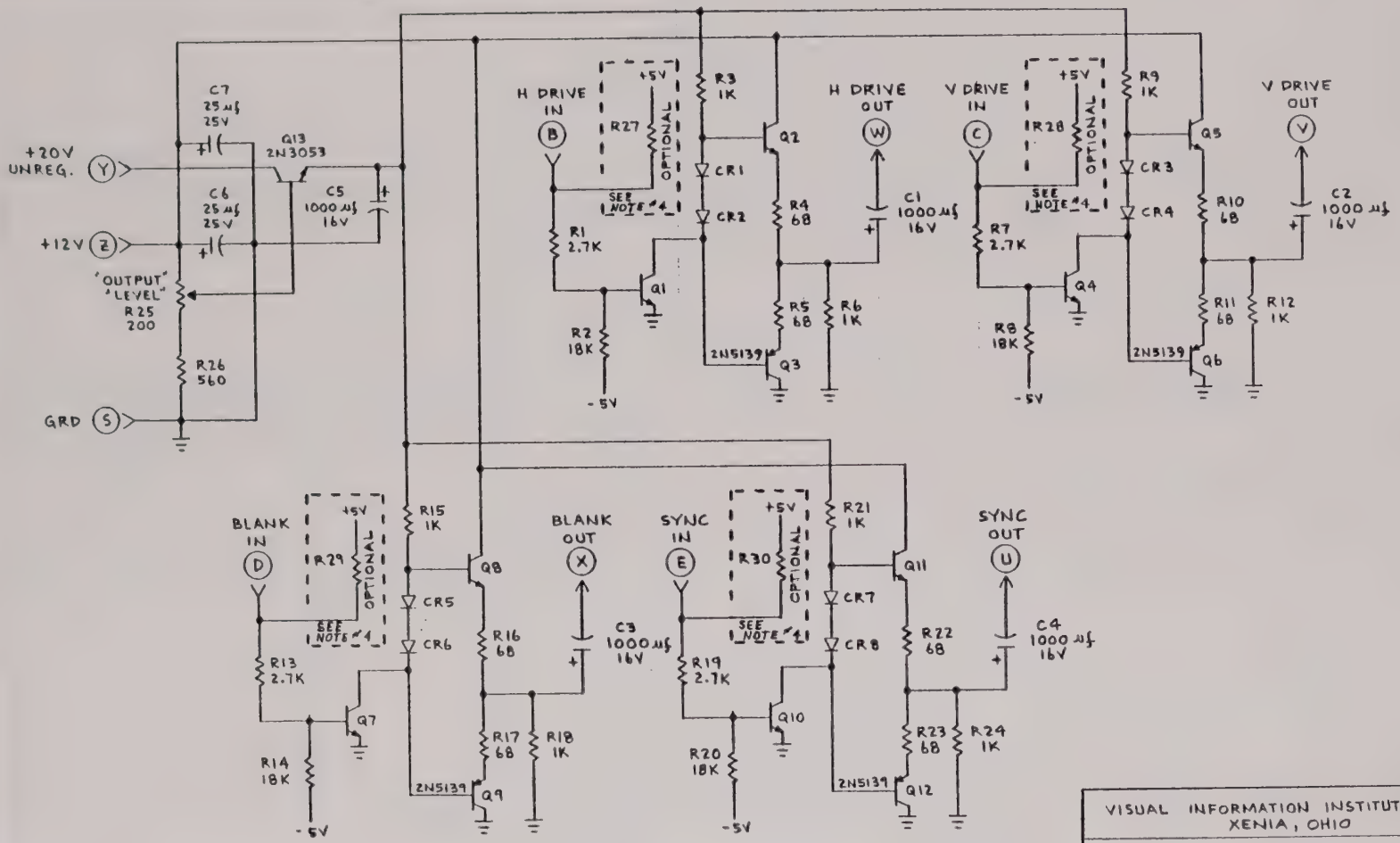
NO. HOLES/BOARD = 122

NOTES: 1) ALL DIODES = IN4154.
2) ALL RESISTORS = 1/4 W, ± 10 % TOL.

POSITION 9A L-2003 PULSE OUTPUT (Group 1)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+12v.	[CHASSIS, TB2, POSITION C]
Y	+DC	[CHASSIS, TB2, POSITION B]
X	BLANK OUT	[REAR PANEL, J3, BLANKING]
W	H DRIVE OUT . . .	[REAR PANEL, J1, H DRIVE]
V	V DRIVE OUT . . .	[REAR PANEL, J2, V DRIVE]
U	SYNC OUT	[REAR PANEL, J4, SYNC]
T	--	
S	GROUND	[PULSE OUTPUT, PIN L][GROUND BUSS]
R	-5v.	[-5v. BUSS]
P	--	
N	--	
M	--	
L	GROUND	[PULSE OUTPUT, PIN S][GROUND BUSS]
K	-5v.	[-5v. BUSS][CHASSIS, TB2, POSITION D]
J	--	
H	--	
F	+5v.	[+5v. BUSS][CHASSIS, TB2, POSITION A]
E	+SYNC IN	[MULTIRATE SYNC, PIN J]
D	+BLANK IN	[QUAD RATE MASTER OSCILLATOR/BLANK, PIN A]
C	+V DRIVE IN . . .	[QUAD RATE MASTER OSCILLATOR/BLANK, PIN C]
B	+H DRIVE IN . . .	[QUAD RATE MONO (16A), PIN A]
A	--	



NOTES:

1) ALL DIODES = IN4154
2) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
3) ALL RESISTORS = 1/4W, ± 10% TOL.
4) FOR OPTIONAL PARTS SEE GROUP LISTINGS, PL-2003 AND L-2003.

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

PULSE OUTPUT

DRN PAT ANTONICK	DATE 7-22-80
APPV'D L.R. Buttrey	DATE 7-25-80
P.C. ART REV. D [11-80]	S-2003
REV. 10-14-83	

PARTS LIST for SYNC FORMAT
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 4-18-84
ARTWORK REV. A (2-84)

PL- 2212
SHT 1 of 2

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP												MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2212		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2212		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-NONE		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2212		
	TRANSISTOR	2N5134	8													BAS	A-1844		
	RESISTOR, FIXED COMP.	4.7K OHMS	8													BAS	A-1450		
	RESISTOR, FIXED COMP.	18K OHMS	8													BAS	A-1450		
	SWITCHES, DIP	SPDT	2													BAS	A-2207-1		
	BUSS WIRE, JUMPER	#22 AWG, SOLID	3													BAS			

PARTS LIST for SYNC FORMAT
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 4-18-84
ARTWORK REV. A (2-84)

PL- 2212
SHT 2 OF 2

SWITCH SETTINGS

Position (ON) ↑

Position (OFF) ↓

Edge of SYNC FORMAT Circuit Card L-2212

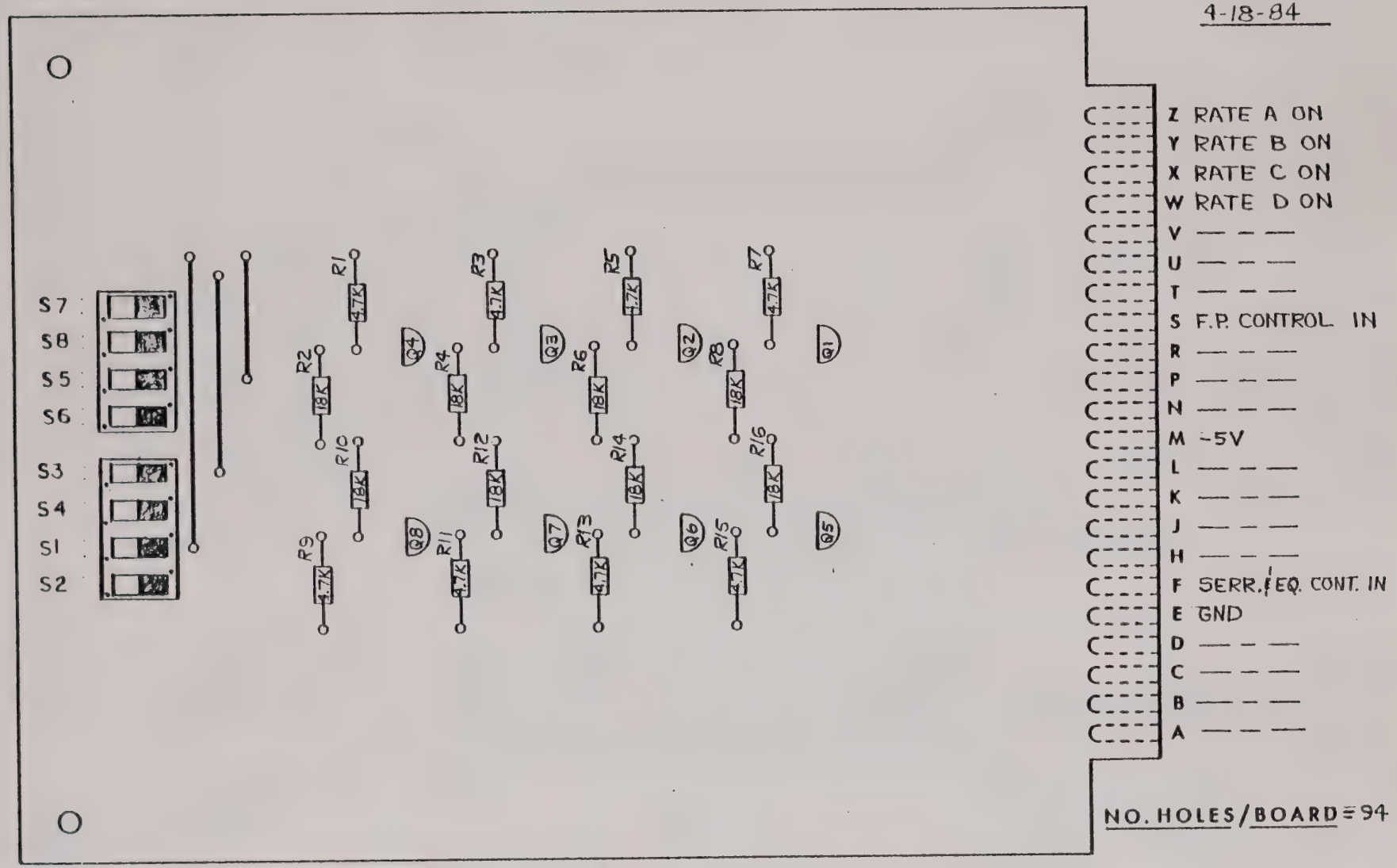
SWITCH SETTINGS SHOWN ARE FOR -
Rate D (Military Format) and Rates A, B, and C (Broadcast Format)

S2	S1	S4	S3	S6	S5	S8	S7
Serr. & Equal.	Front Porch	Serr. & Equal.	Front Porch	Serr. & Equal.	Front Porch	Serr. & Equal.	Front Porch

		SWITCH POSITIONS		
		BROADCAST	INDUSTRIAL	MILITARY
RATE A . .	S1/S2	OFF/OFF	OFF/ON	ON/ON
RATE B . .	S3/S4	OFF/OFF	OFF/ON	ON/ON
RATE C . .	S5/S6	OFF/OFF	OFF/ON	ON/ON
RATE D . .	S7/S8	OFF/OFF	OFF/ON	ON/ON

SYNC FORMAT REV. A (2-84) DWG. NO. L-2212 (GROUP O)

PARTS LIST
4-18-84



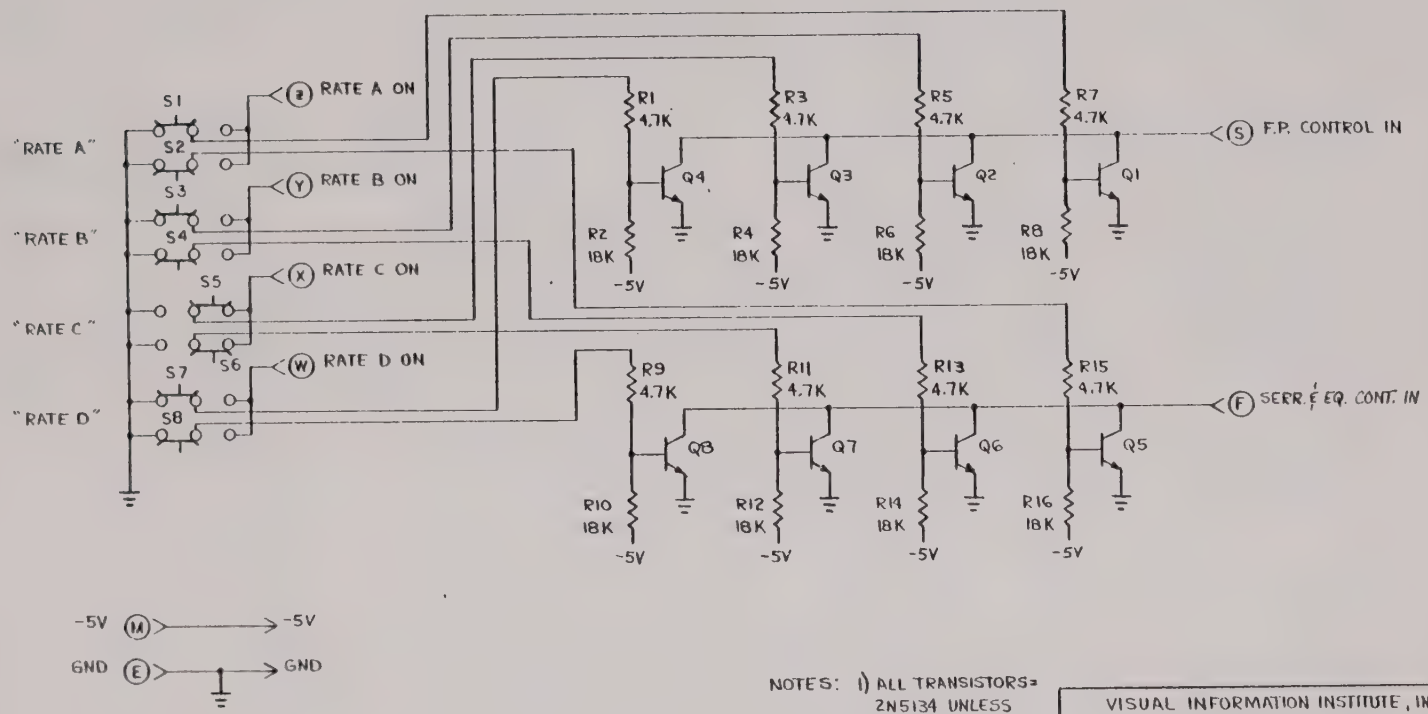
NO. HOLES/BOARD = 94

NOTES: 1). ALL TRANSISTORS = 2N5134 UNLESS NOTED.
2). ALL RESISTORS = ±10%, 1/4W
3). o—o BUS WIRE, #22AWG SOLID

POSITION 10A L-2212 .SYNC FORMAT (Group 0)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	RATE A ON	[QUAD RATE MONO (12A-17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z] [CONTROL PANEL, CALIBRATED MODE - RATE A]
Y	RATE B ON	[QUAD RATE MONO (12A-17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y] [CONTROL PANEL, CALIBRATED MODE - RATE B]
X	RATE C ON	[QUAD RATE MONO (12A-17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X] [CONTROL PANEL, CALIBRATED MODE - RATE C]
W	RATE D ON	[QUAD RATE MONO (12A-17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN S] [CONTROL PANEL, CALIBRATED MODE - RATE D]
V	--	
U	--	
T	--	
S	FP IN	[MULTIRATE SYNC, PINS E, A]
R	--	
P	--	
N	--	
M	-5v.	[-5v. BUSS]
L	--	
K	--	
J	--	
H	--	
F	SERR, EQUAL IN . .	[MULTIRATE SYNC, PIN D]
E	GROUND	[GROUND BUSS]
D	--	
C	--	
B	--	



NOTES: 1) ALL TRANSISTORS = 2N5134 UNLESS NOTED,
2) ALL RESISTORS = ±10%, 1/4 W

VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
SYNC FORMAT	
DRN: D.L. WARNER	DATE: 3-19-84
APP'D: [signature]	DATE: 3-27-84
PC REV. A (2-84)	DWG. NO. 5-2212
REV. 4-18-84	

PARTS LIST for MULTIRATE SYNC
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 4-16-84
ARTWORK REV. D(2-84)

PL-2152
SHT 1 of 2

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP												MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2152		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2152		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-2152		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2152		
	RESISTOR, FIXED COMP.	1K OHMS		19	19											BAS	A-1450		
	RESISTOR, FIXED COMP.	10K OHMS		1	1											↑	A-1450		
	CAPACITOR	0.001μF, 100V		1	1												A-1456		
	↕	100pF		1	1												A-1454		
		0.1μF, 10V		11	11												A-1455		
	CAPACITOR	20μF, 12V		1	1												A-1458		
	I. C.	7400		4	4												A-1747		
	↕	7403		1	1												A-1748		
		7404		1	1														
		7405		1	1												A-1754		
		7408		1	1												A-1755		
		7474		1	1														
		74121		1	1												A-1758		
	I.C.	74279		1	1														
	I.C. SOCKET	14-PIN		10	10											↓	A-1465		
	I.C. SOCKET	16-PIN		1	1											BAS	A-1465		

PARTS LIST for MULTIRATE SYNC
PRINTED CIRCUIT BOARD ASSEMBLY

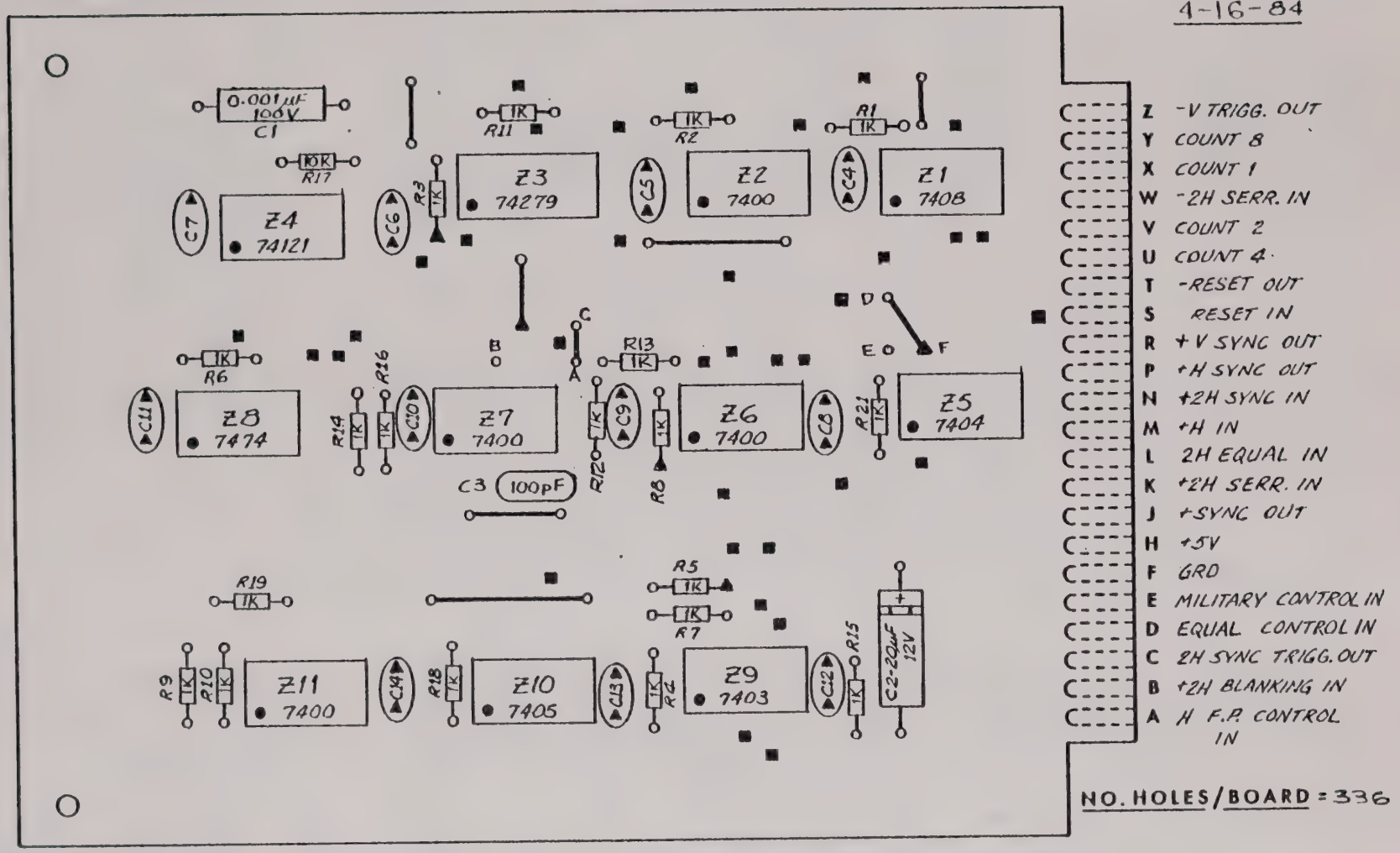
DATE 4-16-84
ARTWORK REV. D(2-84)

PL- 2152
SHT 2 of 2

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
																			$
	BUS WIRE, JUMPER	#22 AWG, SOLID		8	8											BAS			
	WIRE, FEED THRU	#22 AWG, SOLID		35	36											BAS			
REF.	EXTRA COMP. LEAD SOLDER			26	25											BAS			

MULTIRATE SYNC (2-84) REV. D DWG. NO. L-2152 (GROUP I)

PARTS LIST
4-16-84



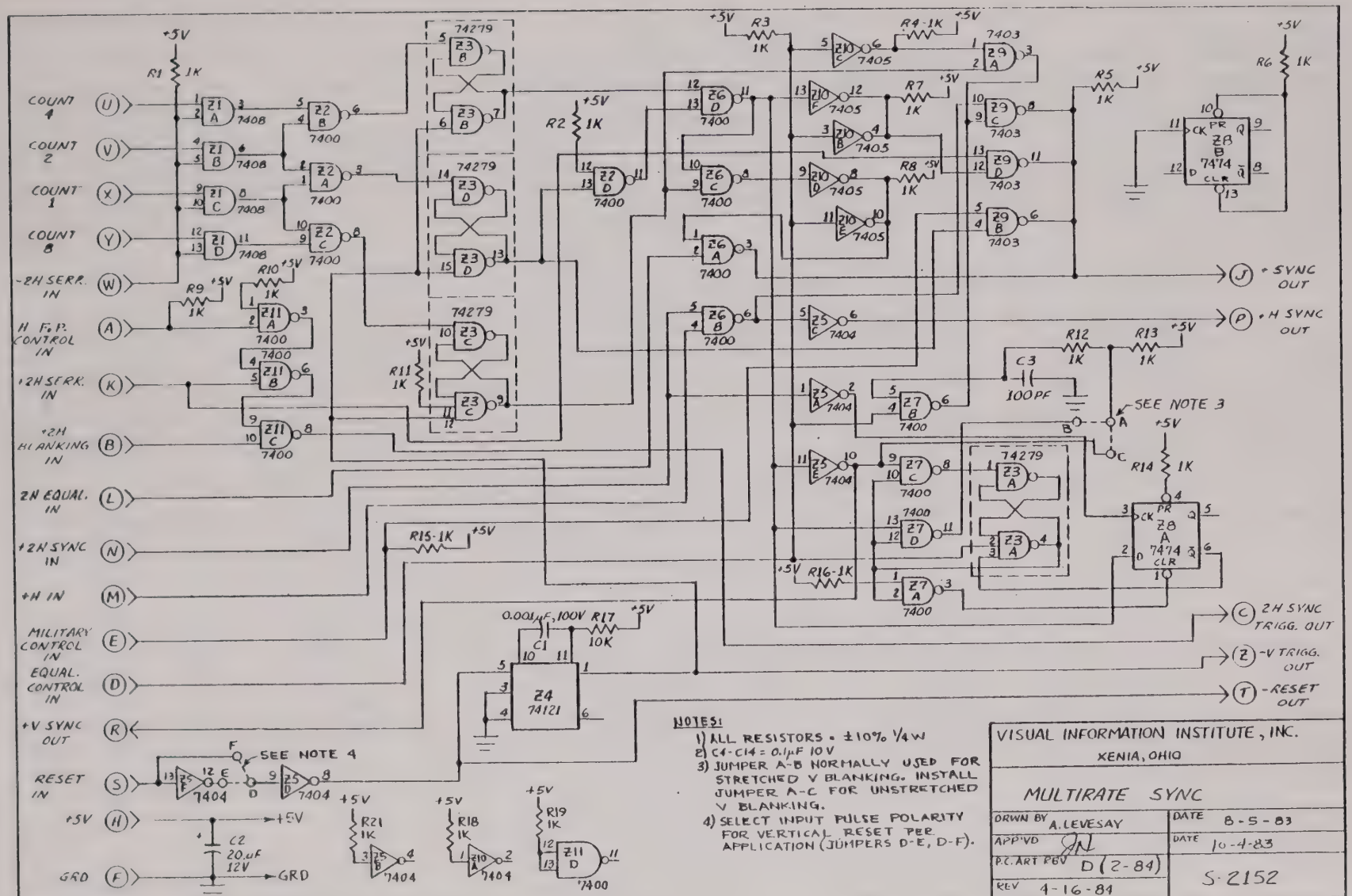
NO. HOLES/BOARD = 336

NOTES:
1. ALL RESISTORS ±10% 1/4 W
2. C4 THRU C14 = 0.1μF 10V
3. o—o BUS WIRE #22AWG SOLID
4. SOLDERING REQ'D BOTH SIDES OF PCB:
   ▲ = COMPONENT LEAD FEED THRU
   ■ = #22AWG WIRE FEED THRU
5. JUMPER A-B NORMALLY USED FOR STRETCHED V BLANKING. INSTALL JUMPER A-C FOR UNSTRETCHED V BLANKING
6. SELECT INPUT PULSE POLARITY FOR VERTICAL RESET PER APPLICATION (JUMPERS D-E, D-F)

POSITION 11A L-2152 MULTIRATE SYNC (Group 1)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	-V TRIGGER OUT . .	[QUAD RATE MASTER OSCILLATOR/BLANK, PIN K]
Y	COUNT 8 IN	[MULTIRATE COUNT, PIN B][MULTIRATE COUNT SELECT (20A), PIN C] [MULTIRATE COUNT SELECT (21A), PIN P] [MULTIRATE COUNT SELECT (22A), PIN R]
X	COUNT 1 IN	[MULTIRATE COUNT, PIN K][MULTIRATE COUNT SELECT (21A), PINS N, C] [MULTIRATE COUNT SELECT (22A), PIN D]
W	--	
V	COUNT 2 IN	[MULTIRATE COUNT, PIN F][MULTIRATE COUNT SELECT (21A), PINS M, B] [MULTIRATE COUNT SELECT (22A), PIN C]
U	COUNT 4 IN	[MULTIRATE COUNT, PIN E][MULTIRATE COUNT SELECT (20A), PIN B] [MULTIRATE COUNT SELECT (21A), PIN R] [MULTIRATE COUNT SELECT (22A), PIN B]
T	--	
S	+RESET IN	[MULTIRATE COUNT, PIN X][MULTIRATE COUNT SELECT (20A), PINS L, H, E] [MULTIRATE COUNT SELECT (21A), PINS L, H]
R	--	
P	--	
N	+2H SYNC IN	[QUAD RATE MONO (15A), PIN A]
M	+H INPUT	[MULTIRATE COUNT, PIN M]
L	2H EQUAL IN	[QUAD RATE MONO (13A), PIN K]
K	+2H SERR IN	[QUAD RATE MONO (12A), PIN A][QUAD RATE MONO (13A), PIN F]
J	+SYNC IN	[PULSE OUTPUT, PIN E]
H	+5v.	[+5v. BUSS]
F	GROUND	[GROUND BUSS]
E	MILITARY CONTROL .	[MULTIRATE SYNC, PIN A][SYNC FORMAT, PIN S]
D	EQUAL CONTROL . . .	[SYNC FORMAT, PIN F]
C	2H SYNC TRIGGER . .	[QUAD RATE MONO (15A), PIN F]
B	+2H BLANK IN . . .	[QUAD RATE MONO (17A), PIN A]
A	FP CONTROL	[MULTIRATE SYNC, PIN E][SYNC FORMAT, PIN S]



NOTES:

1) ALL RESISTORS = ±10% 1/4W
2) C1-C14 = 0.1µF 10V
3) JUMPER A-B NORMALLY USED FOR STRETCHED V BLANKING. INSTALL JUMPER A-C FOR UNSTRETCHED V BLANKING.
4) SELECT INPUT PULSE POLARITY FOR VERTICAL RESET PER APPLICATION (JUMPERS D-E, D-F).

PARTS LIST for QUAD RATE MONO
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 11-4-84
ARTWORK REV. B (9-79)

PL- 2101
SHT 1 of 4

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2101		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2101		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-NONE		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2101		
	DIODE	IN4154		1	1	1	1	1	1	1	1	1	1	1	1	BAS	A-1797		
	TRANSISTOR	2N5134		12	12	12	12	12	12	12	12	12	10	6	10		A-1844		
	TRANSISTOR	2N5139		3	3	3	3	3	3	3	3	3	1	1	1		A-1845		
	RESISTOR, FIXED COMP.	47 OHMS		1	1	1	1	1	1	1	1	1	1	1	1		A-1450		
		100		1	1	1	1	1	1	1	1	1	1	1	1				
		470		5	5	5	5	5	5	5	5	5	3	3	3				
		820		X	X	X	X	X	X	X	X	1	X	1	X				
		1K		5	5	5	5	5	6	5	6	5	4	4	4				
		1.5K		X	X	X	1	X	X	1	X	X	X	X	X				
		2.2K		2	1	1	1	2	1	1	1	1	X	X	X				
		2.7K		5	5	6	5	5	5	5	6	5	6	5	6				
		3.3K		X	X	X	X	X	1	X	X	1	X	X	X				
		4.7K		7	7	7	8	7	7	8	7	7	5	1	5				
		5.6K		X	X	X	X	1	X	X	X	X	X	X	X				
		6.8K		1	X	1	X	X	X	X	X	X	X	X	X				
		10K		2	2	2	2	2	2	2	2	2	1	2	1				
		15K		X	X	X	X	X	X	X	X	X	X	X	X				
	RESISTOR, FIXED COMP.	18K OHMS		9	9	9	9	9	9	9	9	9	9	5	9	BAS	A-1450		

PARTS LIST for QUAD RATE MONO

PRINTED CIRCUIT BOARD ASSEMBLY

DATE 11-4-84

ARTWORK REV. B (9-79)

PL- 2101

SHT 2 of 4

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			13	14	15	16	17	18	19	20	21	22	23	24	25				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2101		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2101		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-NONE		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2101		
	DIODE	IN4154	1	1	1	1	1	1								BAS	A-1797		
	TRANSISTOR	2N5134	10	10	10	10	10	6									A-1844		
	TRANSISTOR	2N5139	1	1	1	1	1	1									A-1845		
	RESISTOR, FIXED COMP.	47 OHMS	1	1	1	1	1	1									A-1450		
		100	1	1	1	1	1	1											
		470	3	3	3	3	3	3											
		820	X	X	X	X	X	X											
		1K	4	4	5	4	5	4											
		1.5K	1	X	X	1	X	X											
		2.2K	X	1	X	X	X	X											
		2.7K	5	5	5	5	5	5											
		3.3K	X	X	X	X	X	X											
		4.7K	5	5	5	5	5	1											
		5.6K	X	X	X	X	X	X											
		6.8K	X	X	X	X	X	X											
		10K	1	1	1	1	1	2											
		15K	X	X	X	X	X	X											
	RESISTOR, FIXED COMP.	18K OHMS	9	9	9	9	9	5								BAS	A-1450		

PARTS LIST for QUAD RATE MONO
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 11-4-84
ARTWORK REV. B (9-79)

PL- 2101
SHT 3 of 4

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				$
	RESISTOR, FIXED COMP.	22K OHMS		X	1	X	X	X	X	X	X	X	X	X	X	BAS	A-1450		
	RESISTOR, VARIABLE	5K OHMS		4	4	4	4	4	4	4	4	4	4	1	4		A-1460		
	CAPACITOR	10 PF		1	1	1	1	1	1	1	1	1	1	1	1		A-1454		
		100 PF		1	1	1	1	1	1	1	1	1	1	1	1				
		200 PF		X	X	X	X	X	1	X	X	X	X	X	X				
		300 PF		X	X	X	X	X	X	1	1	X	X	X	X				
		750 PF		X	X	X	1	1	X	X	X	1	X	1	X		A-1454		
		0.1 μF, 10V		1	1	1	1	1	1	1	1	1	1	1	1		A-1455		
		0.001 μF, 100V		2	2	2	2	2	2	2	2	2	2	2	2		A-1456		
		0.0022 μF, 100V		X	X	1	X	X	X	X	X	X	1	X	1		A-1456		
		0.22 μF, 35V		1	1	X	X	X	X	X	X	X	X	X	X		A-1457		
	CAPACITOR	0.33 μF, 35V		X	X	X	X	X	X	X	X	X	X	X	X		A-1457		
	CAPACITOR	0.0068 μF, 100V		X	X	X	X	X	X	X	X	X	X	X	X		A-1456		
	BUS WIRE, JUMPER	#24 AWG. SOLID		1	1	1	1	1	1	1	1	1	1	2	1	BAS			

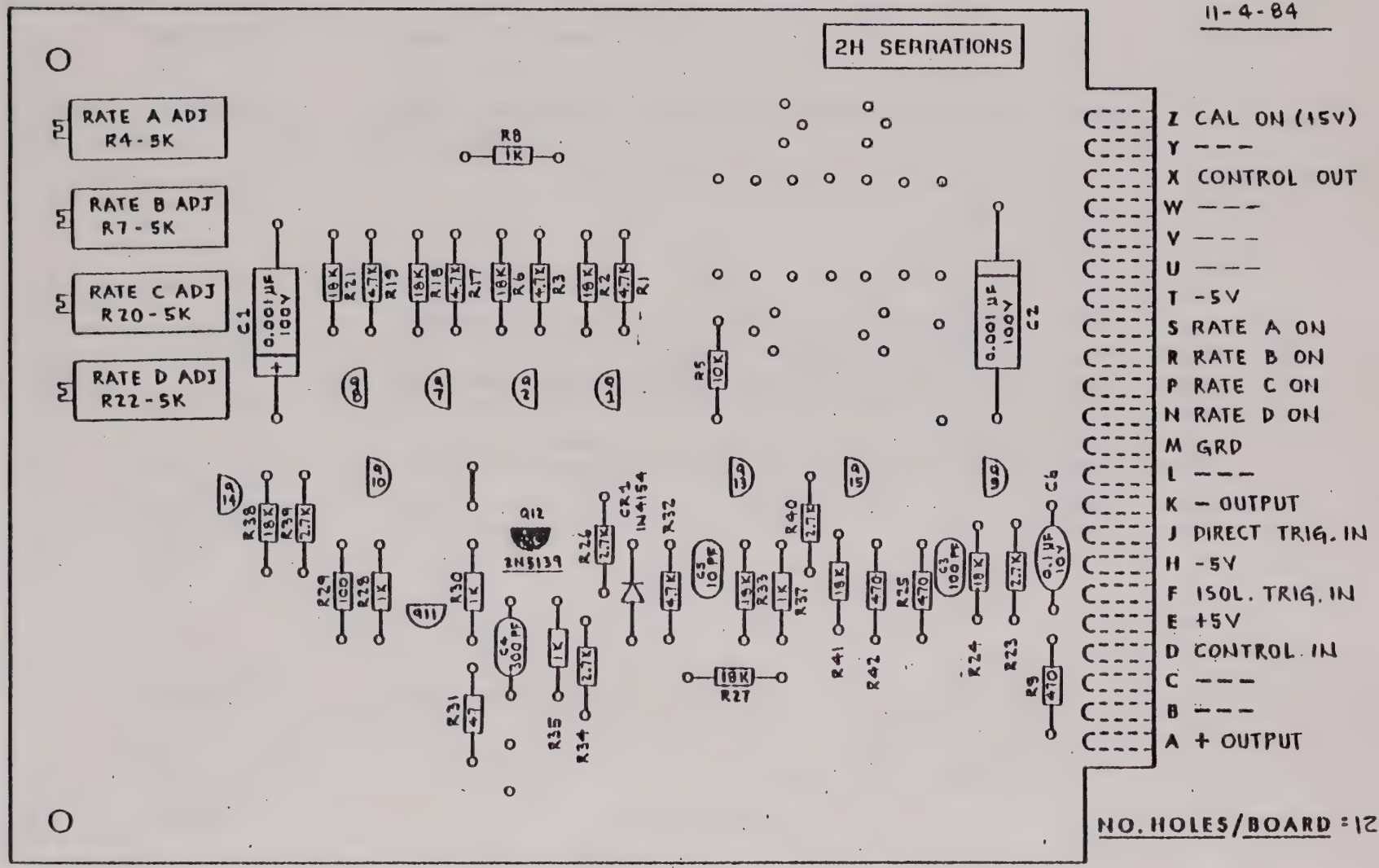
PARTS LIST for QUAD RATE MONO — DATE 11-4-84 — PL-2101

PRINTED CIRCUIT BOARD ASSEMBLY — ARTWORK REV. B (9-79) — SHT 4 of 4

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP 13	14	15	16	17	18	19	20	21	22	23	24	25	MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
																			$
	RESISTOR, FIXED COMP.	22K OHMS	X	X	X	X	X	X								BAS	A-1450		
	RESISTOR, VARIABLE	5K OHMS	4	4	4	4	4	1									A-1460		
	CAPACITOR	10 pF	1	1	1	1	1	1									A-1454		
		100 pF	1	1	1	1	1	1											
		200 pF	X	X	1	X	X	X											
		300 pF	X	X	X	1	1	X											
		750 pF	1	1	X	X	X	X									A-1454		
		0.1 µF, 10V	1	1	1	1	1	1									A-1455		
		0.001 µF, 100V	2	2	2	2	2	2									A-1456		
		0.0022 µF, 100V	X	X	X	X	X	X									A-1456		
		0.22 µF, 35V	X	X	X	X	X	X									A-1457		
	CAPACITOR	0.33 µF, 35V	X	X	X	X	X	X									A-1457		
	CAPACITOR	0.0068 µF, 100V	X	X	X	X	X	1									A-1456		
	BUS WIRE, JUMPER	#22 AWG, SOLID	1	1	1	1	1	2								BAS			

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 17)

PARTS LIST
11-4-84



NO. HOLES/BOARD = 121

NOTES: 1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10 % TOL.
3) o—o BUS WIRE, # 22 AWG. SOLID.

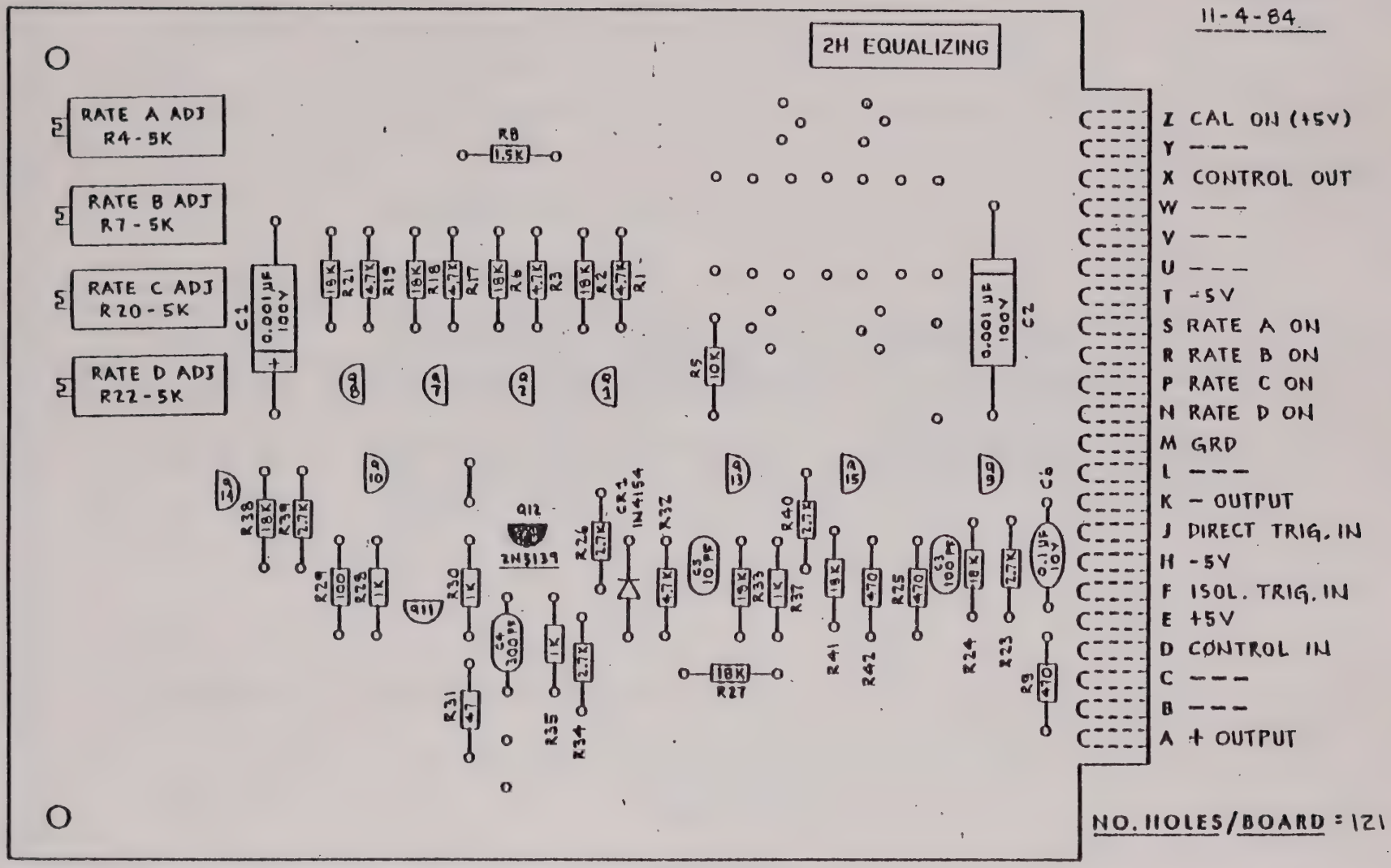
POSITION 12A L-2101 QUAD RATE MONO (2H SERRATIONS) (Group 17)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	CAL ON (+5v.) . .	[QUAD RATE MONO (13A-17A), PIN Z][+5v. BUSS]
Y	--	
X	CONTROL OUT . . .	[QUAD RATE MONO (12A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON	[QUAD RATE MONO (13A-17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z][SYNC FORMAT, PIN Z]
R	RATE B ON	[QUAD RATE MONO (13A-17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON	[QUAD RATE MONO (13A-17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON	[QUAD RATE MONO (13A-17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	--	
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . . .	[QUAD RATE MONO (14A), PIN F][MULTIRATE COUNT, PIN T]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . . .	[QUAD RATE MONO (12A), PIN X]
C	--	
B	--	
A	+OUT	[MULTIRATE SYNC, PIN K][QUAD RATE MONO (13A), PIN F]

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 16)

PARTS LIST
11-4-84



NO. HOLES/BOARD = 121

NOTES: 1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10 % TOL.
3) o—o BUS WIRE, # 22 AWG. SOLID.

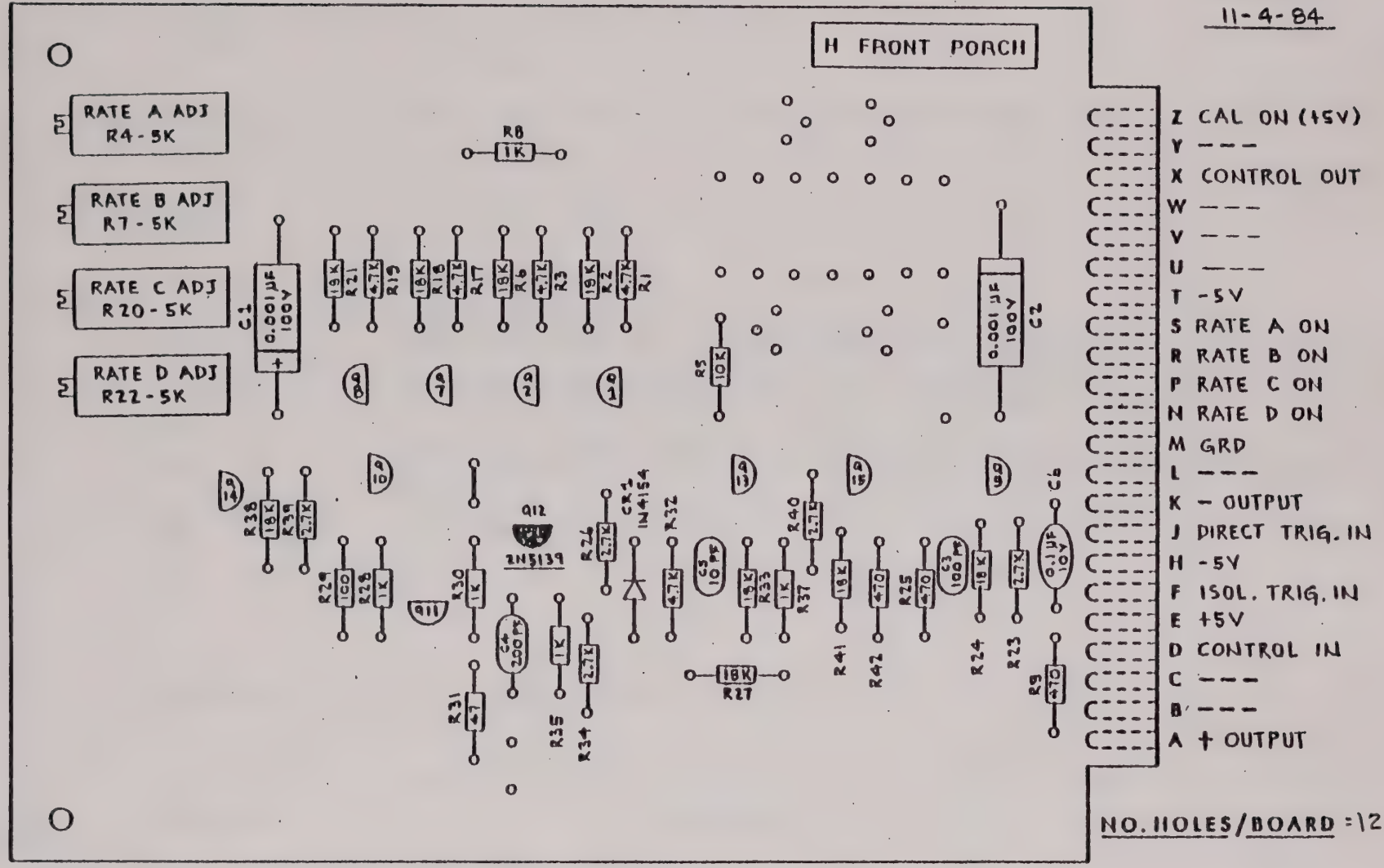
POSITION 13A L-2101 QUAD RATE MONO (2H EQUALIZING) (Group 16)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	CAL ON (+5v.) .	[QUAD RATE MONO (12A,14A-17A), PIN Z][+5v. BUSS]
Y	--	
X	CONTROL OUT . .	[QUAD RATE MONO (13A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON . . .	[QUAD RATE MONO (12A,14A-17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z][SYNC FORMAT, PIN Z]
R	RATE B ON . . .	[QUAD RATE MONO (12A,14A-17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON . . .	[QUAD RATE MONO (12A,14A-17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON . . .	[QUAD RATE MONO (12A,14A-17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	-OUT	[MULTIRATE SYNC, PIN L]
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . .	[QUAD RATE MONO (12A), PIN A][MULTIRATE SYNC, PIN K]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . .	[QUAD RATE MONO (13A), PIN X]
C	--	
B	--	
A	--	

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 15)

PARTS LIST
11-4-84



NO. HOLES/BOARD = 121

NOTES:
1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10 % TOL.
3) o—o BUS WIRE, # 22 AWG. SOLID.

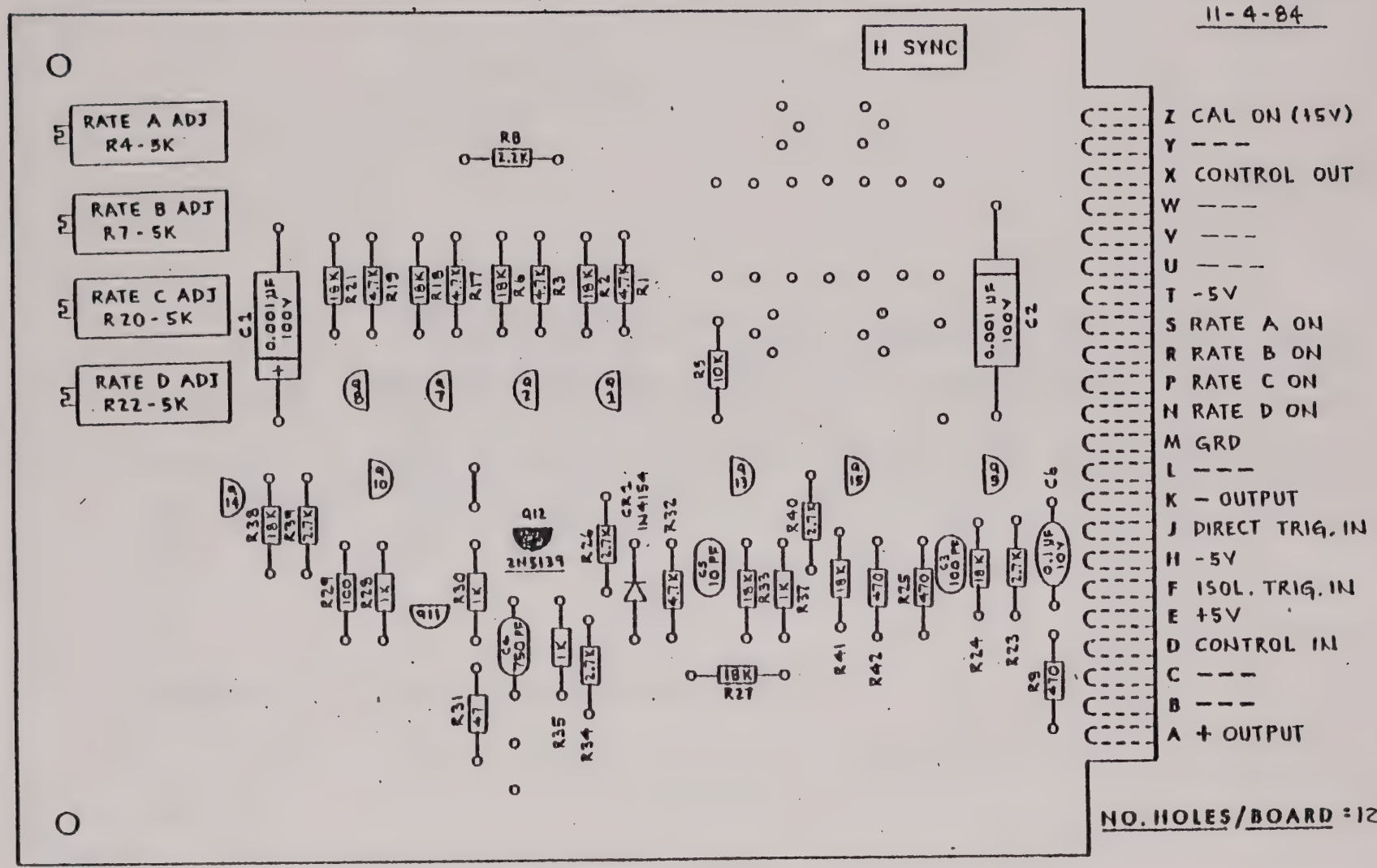
POSITION 14A L-2101 QUAD RATE MONO (2H FRONT PORCH) (Group 15)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS.

CONNECTOR PIN	FUNCTION	DESTINATION
Z	CAL ON (+5v.) . .	[QUAD RATE MONO (12A,13A,15A-17A), PIN Z][+5v. BUSS]
Y	--	
X	CONTROL OUT . . .	[QUAD RATE MONO (14A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON	[QUAD RATE MONO (12A,13A,15A-17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z][SYNC FORMAT, PIN Z]
R	RATE B ON	[QUAD RATE MONO (12A,13A,15A-17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON	[QUAD RATE MONO (12A,13A,15A-17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON	[QUAD RATE MONO (12A,13A,15A-17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	-OUT	[MULTIRATE COUNT, PIN R]
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . . .	[QUAD RATE MONO (12A), PIN F][MULTIRATE COUNT, PIN T]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . . .	[QUAD RATE MONO (14A), PIN X]
C	--	
B	--	
A	+OUT	[QUAD RATE MONO (17A), PIN F]

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 14)

PARTS LIST
11-4-84



NO. HOLES/BOARD = 121

NOTES:
1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10 % TOL.
3) o—o BUS WIRE, # 22 AWG. SOLID.

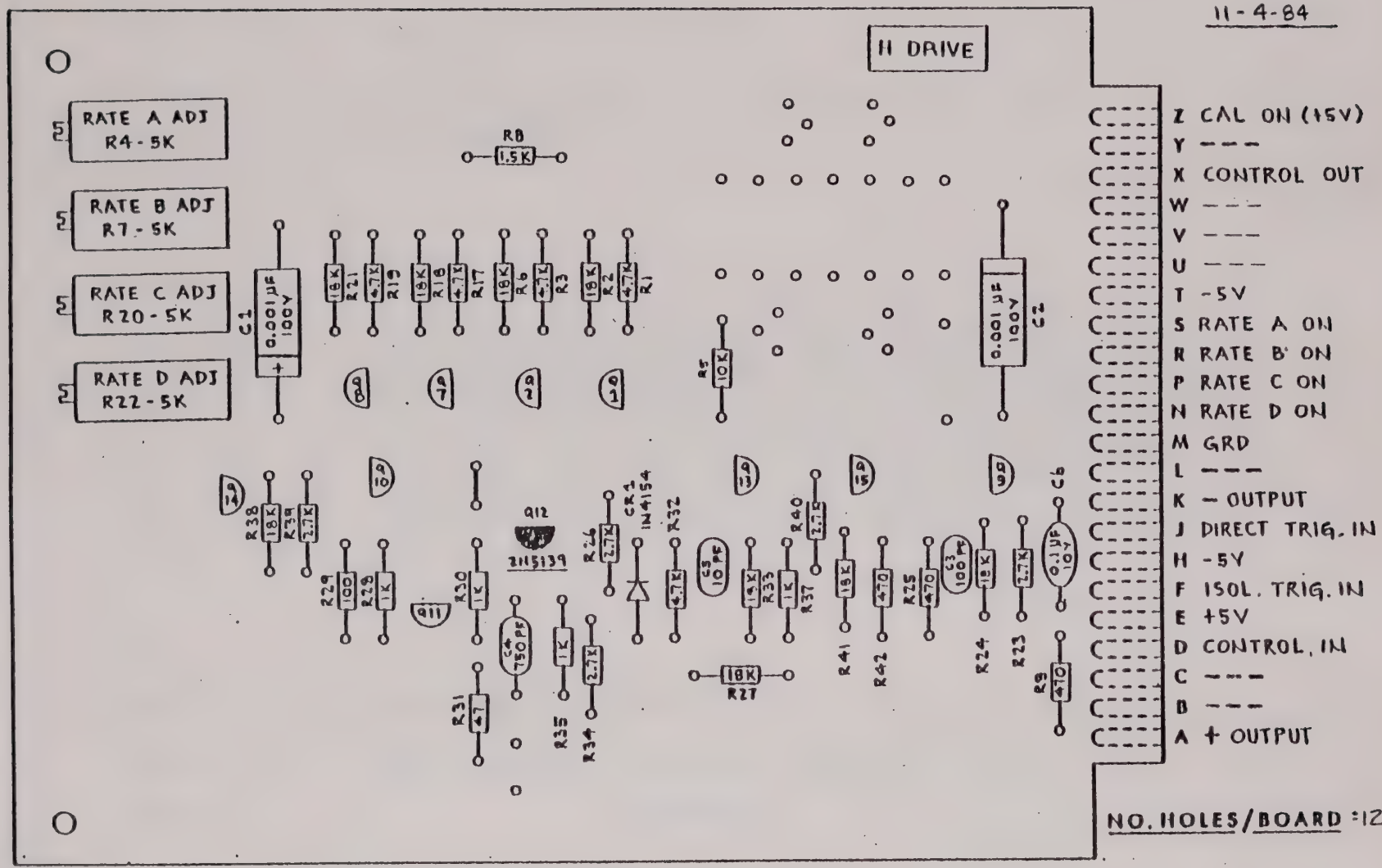
POSITION 15A L-2101 QUAD RATE MONO (2H SYNC) (Group 14)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Ƶ	CAL ON (+5v.) . .	[QUAD RATE MONO (12A-14A,16A,17A), PIN Ƶ][+5v. BUSS]
Y	--	
X	CONTROL OUT . . .	[QUAD RATE MONO (15A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON	[QUAD RATE MONO (12A-14A,16A,17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Ƶ][SYNC FORMAT, PIN Ƶ]
R	RATE B ON	[QUAD RATE MONO (12A-14A,16A,17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON	[QUAD RATE MONO (12A-14A,16A,17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON	[QUAD RATE MONO (12A-14A,16A,17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	--	
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . . .	[MULTIRATE SYNC, PIN C]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . . .	[QUAD RATE MONO (15A), PIN Y]
C	--	
B	--	
A	+OUT	[MULTIRATE SYNC, PIN N]

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 13)

PARTS LIST
11-4-84



NO. HOLES/BOARD = 121

NOTES:
1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10 % TOL.
3) o—o BUS WIRE, # 22 AWG. SOLID.

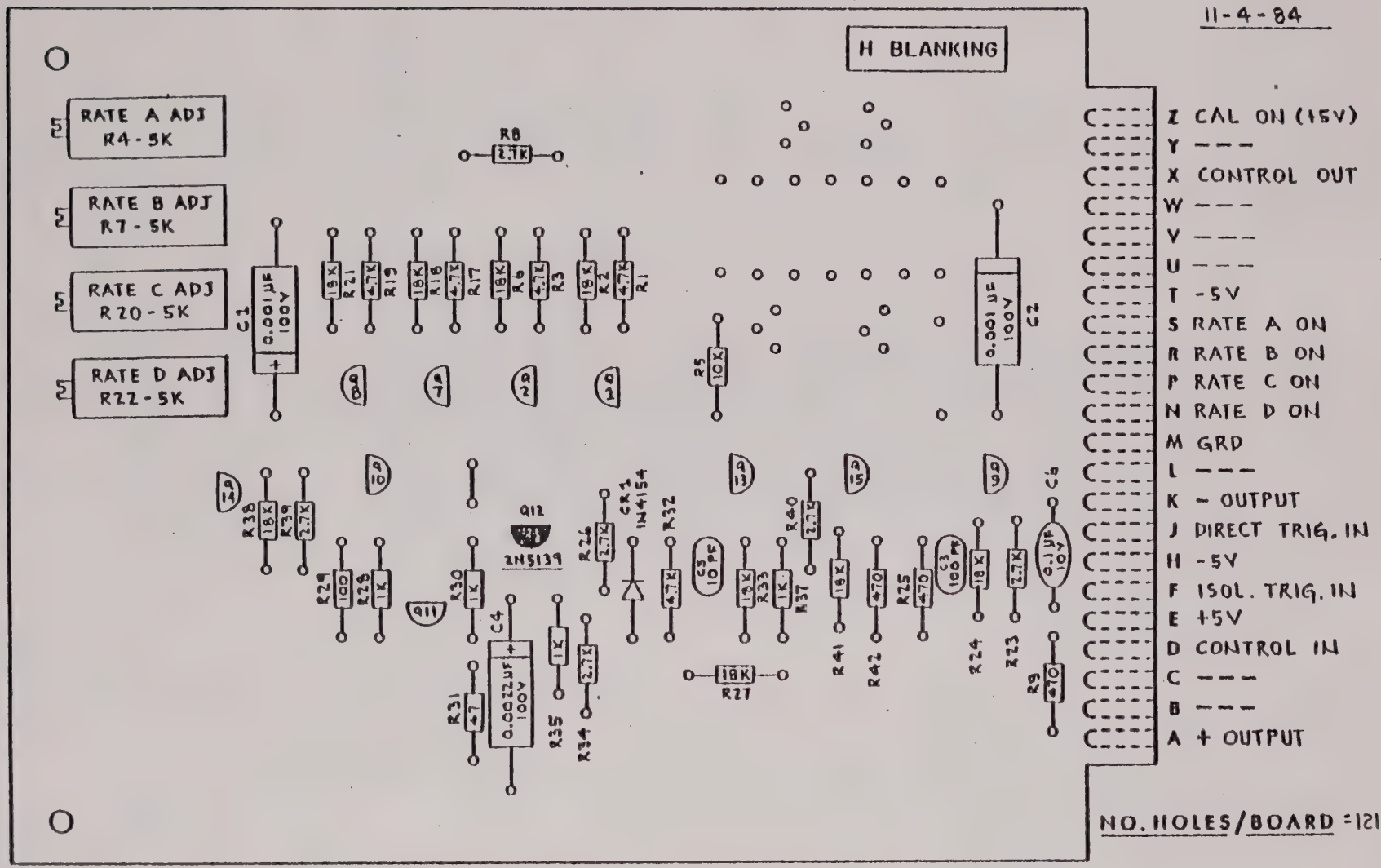
POSITION 16A L-2101 QUAD RATE MONO (H DRIVE) (Group 13)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	CAL ON (+5v.) . .	[QUAD RATE MONO (12A-15A,17A), PIN Z][+5v. BUSS]
Y	--	
X	CONTROL OUT . . .	[QUAD RATE MONO (16A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON	[QUAD RATE MONO (12A-15A,17A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z][SYNC FORMAT, PIN Z]
R	RATE B ON	[QUAD RATE MONO (12A-15A,17A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON	[QUAD RATE MONO (12A-15A,17A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON	[QUAD RATE MONO (12A-15A,17A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	--	
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . . .	[QUAD RATE MO/BLANK, PIN N][MULTIRATE COUNT, PIN N]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . . .	[QUAD RATE MONO (16A), PIN X]
C	--	
B	--	
A	+OUT	[PULSE OUTPUT, PIN B]

QUAD RATE MONO 9-79 REV. B DWG. NO. L-2101 (GROUP 12)

PARTS LIST
11-4-84



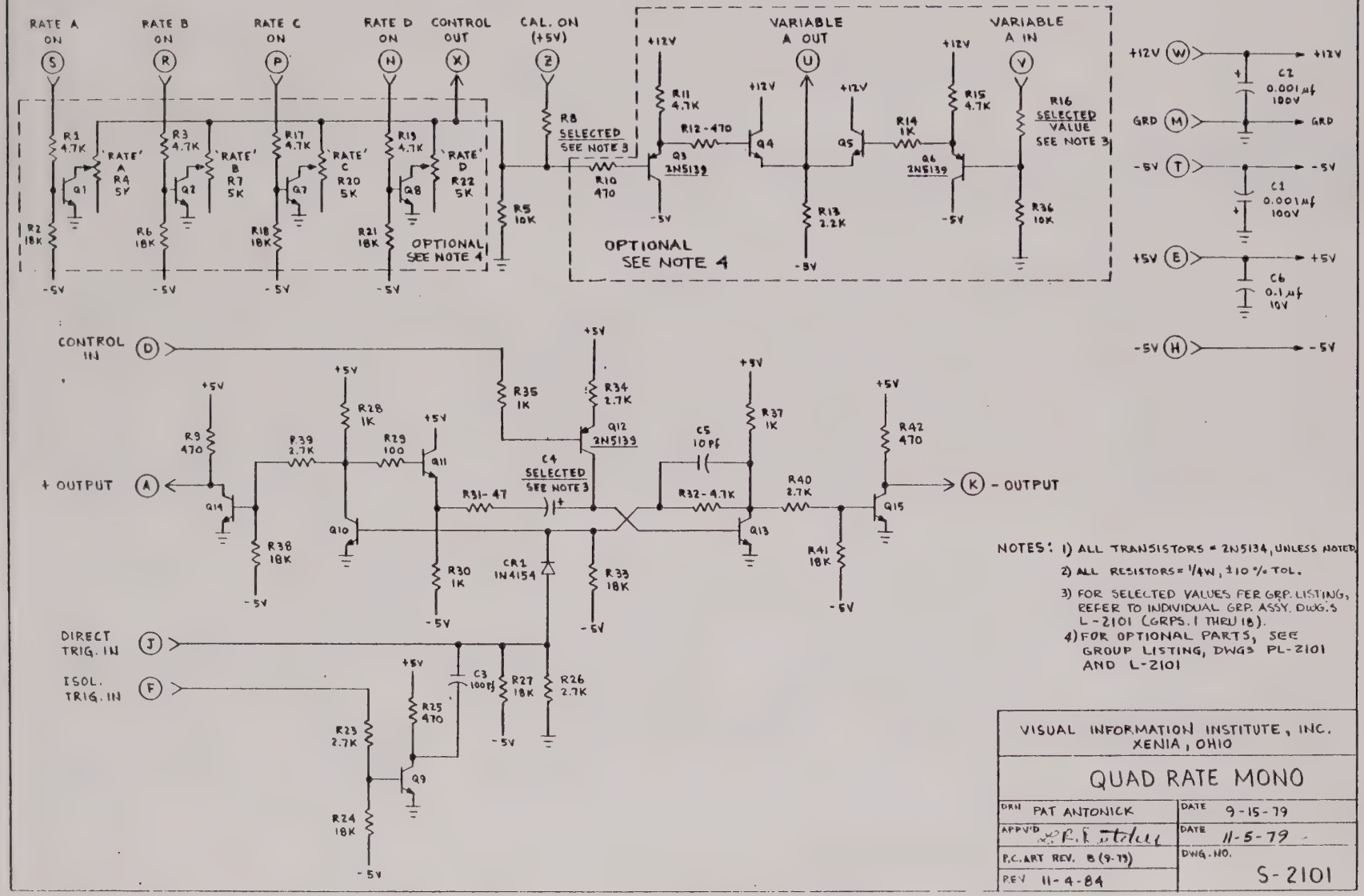
NO. HOLES/BOARD = 121

NOTES: 1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4 W, ±10% TOL.
3) o—o BUS WIRE, # 22 AWG, SOLID.

POSITION 17A L-2101 QUAD RATE MONO (2H BLANK) (Group 12)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	CAL ON (+5v.) . .	[QUAD RATE MONO (12A-16A), PIN Z][+5v. BUSS]
Y	--	
X	CONTROL OUT . . .	[QUAD RATE MONO (17A), PIN D]
W	--	
V	--	
U	--	
T	-5v.	[-5v. BUSS]
S	RATE A ON	[QUAD RATE MONO (12A-16A), PIN S][QUAD RATE MO/BLANK, PIN V] [MULTIRATE COUNT SELECT (20A-22A), PIN Z][SYNC FORMAT, PIN Z]
R	RATE B ON	[QUAD RATE MONO (12A-16A), PIN R][QUAD RATE MO/BLANK, PIN U] [MULTIRATE COUNT SELECT (20A-22A), PIN Y][SYNC FORMAT, PIN Y]
P	RATE C ON	[QUAD RATE MONO (12A-16A), PIN P][QUAD RATE MO/BLANK, PIN T] [MULTIRATE COUNT SELECT (20A-22A), PIN X][SYNC FORMAT, PIN X]
N	RATE D ON	[QUAD RATE MONO (12A-16A), PIN N][QUAD RATE MO/BLANK, PIN S] [MULTIRATE COUNT SELECT (20A-22A), PIN W][SYNC FORMAT, PIN W]
M	GROUND	[GROUND BUSS]
L	--	
K	-OUT	[QUAD RATE MO/BLANK, PIN P]
J	--	
H	-5v.	[-5v. BUSS]
F	TRIGGER IN . . .	[QUAD RATE MONO (14A), PIN A]
E	+5v.	[+5v. BUSS]
D	CONTROL IN . . .	[QUAD RATE MONO (17A), PIN X]
C	--	
B	--	
A	+OUT	[MULTIRATE SYNC, PIN B]



NOTES:
1) ALL TRANSISTORS = 2N5134, UNLESS NOTED.
2) ALL RESISTORS = 1/4W, ±10% TOL.
3) FOR SELECTED VALUES FER GRP. LISTING, REFER TO INDIVIDUAL GRP. ASSY. DWG.S L-2101 (GRPS. 1 THRU 18).
4) FOR OPTIONAL PARTS, SEE GROUP LISTING, DWGS PL-2101 AND L-2101

VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
QUAD RATE MONO	
DRN PAT ANTONICK	DATE 9-15-79
APP'VD	DATE 11-5-79
P.C. ART REV. B (9-79)	DWG. NO. S-2101
REV 11-4-84	

PARTS LIST for QUAD RATE M.O./BLANKING
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 5-2-84
ARTWORK REV. D(5-84)

PL-2149
SHT 1 of 2

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP												MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2149		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2149		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-2149		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2149		
	TRANSISTOR	2N5134		5	5											BAS	A-1844		
	RESISTOR, FIXED COMP.	330 OHMS		4	4												A-1450		
		470		5	5														
		1K		17	16														
		2.7K		1	1														
		4.7K		4	4														
	RESISTOR, FIXED COMP.	18K OHMS		5	5												A-1450		
	CAPACITOR	15 pF		4	4												A-1454		
		20pF		4	4												A-1454		
		0.1μF, 10V		11	11												A-1455		
	CAPACITOR	20μF, 12V		3	3												A-1458		
	I.C.	7400		6	6												A-1747		
		7404		1	1														
		7405		1	1												A-1754		
		7474		1	1														
		7490		1	1												A-1757		
	I.C.	74279		1	1											BAS			

PARTS LIST for QUAD RATE M.O./BLANKING
PRINTED CIRCUIT BOARD ASSEMBLY

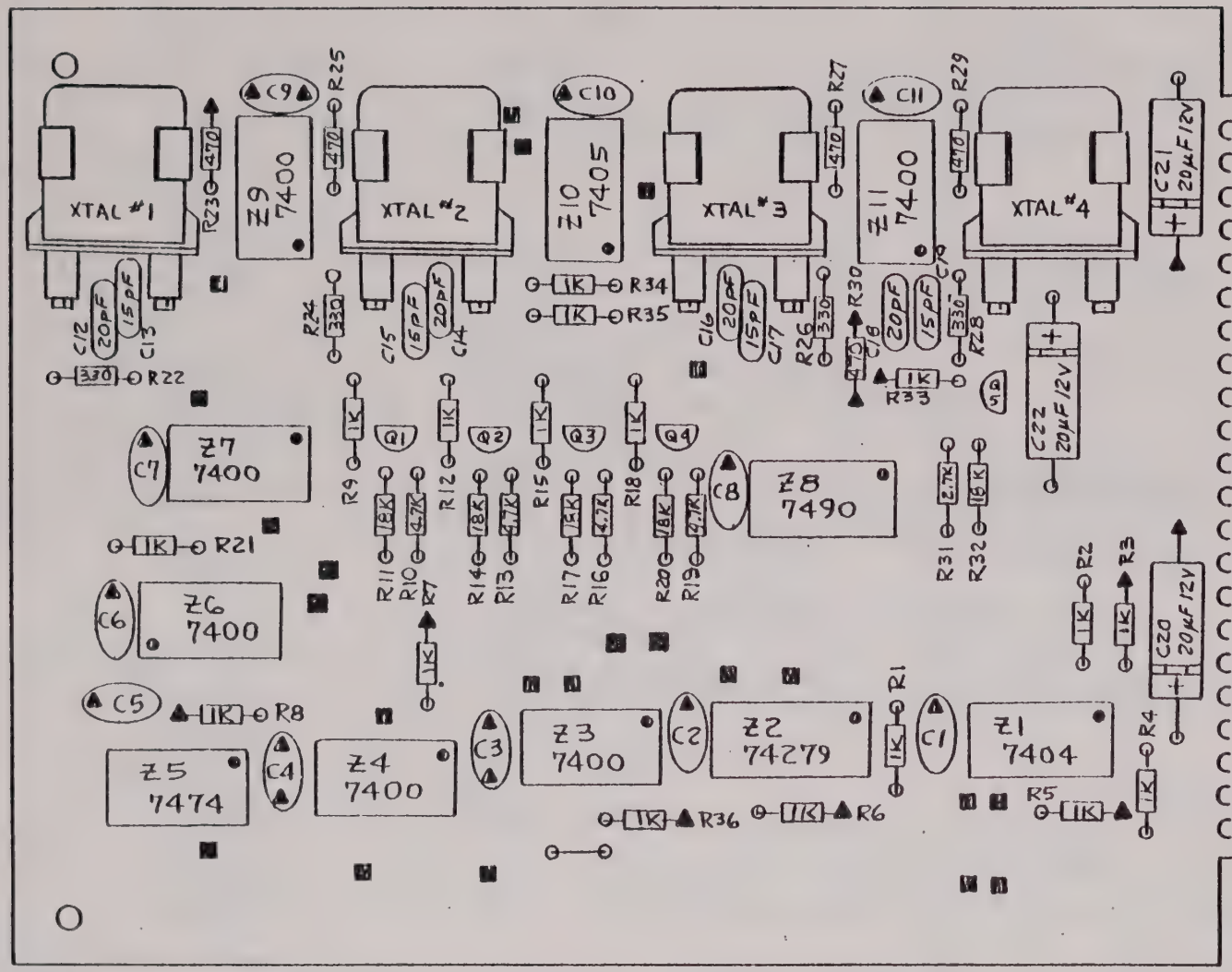
DATE 5-2-84
ARTWORK REV. D(5-84)

PL- 2149
SHT 2 of 2

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
																			$
	I.C. SOCKET	14 PINS		10	10											BAS	A-1465		
	I.C. SOCKET	16 PINS		1	1											↑	A-1465		
																↓			
XTAL-1	CRYSTAL (200H)	SEL. PER APPLICATION		1	1												A-1764		
XTAL-2	CRYSTAL (200H)	SEL. PER APPLICATION		1	1												A-1764		
XTAL-3	CRYSTAL (200H)	SEL. PER APPLICATION		1	1												A-1764		
XTAL-4	CRYSTAL (200H)	SEL. PER APPLICATION		1	1												A-1764		
	CRYSTAL SOCKET			4	4														
	SCREW, BINDER HEAD	#2-56 UNC X 3/16 LG.		8	8														
	NUT HEX	#2-56 UNC THD.		8	8														
	BUS WIRE, JUMPER	#22 AWG, SOLID		1	1														
	WIRE FEED THRU	#22 AWG, SOLID		23	23											BAS			
REF.	EXTRA COMP. LEAD SOLDER			26	26														

QUAD RATE M.O./BLANKING REV. D (5-84) DWG. NO. L-2149 (GROUP 1)

PARTS LIST
5-2-84



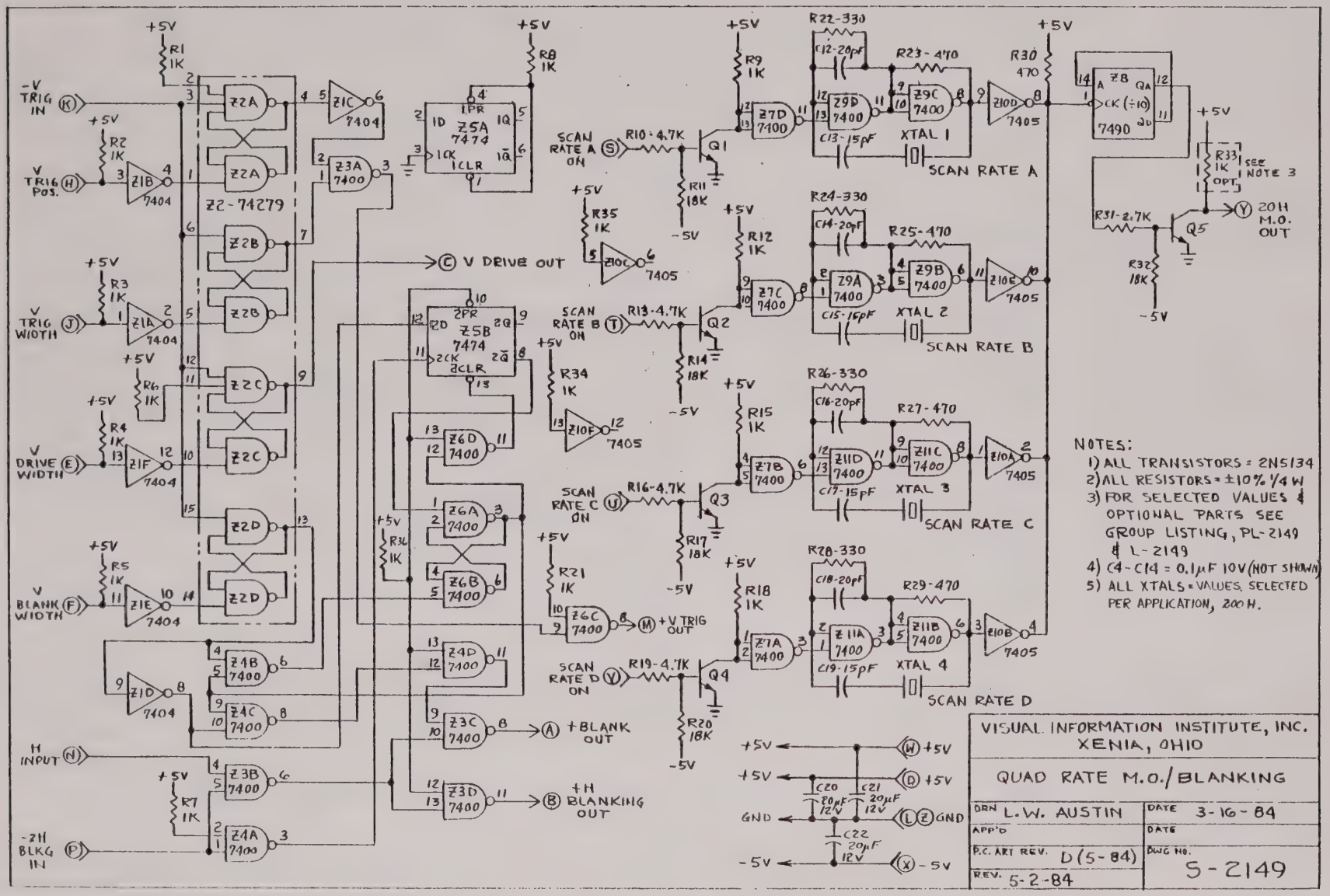
NO. HOLES/BOARD = 369

NOTES:
1) ALL TRANSISTORS = 2N5134
2) ALL RESISTORS = ±10% 1/4 W
3) C4-C14 = 0.1µF 10V
4) FOR SELECTED VALUES & OPTIONAL PARTS SEE GROUP LISTING, PL-2149 & L-2149
5) ALL XTALS, SEE PL-2149 SHT. 2 - USE INSULATOR UNDER EACH XTAL
6) o—o BUS WIRE #22 AWG, SOLID
7) SOLDERING REQ'D BOTH SIDES:
▲ = COMPONENT LEAD FEED THRU
■ = #22 AWG BUS WIRE FEED THRU

POSITION 18A L-2149 QUAD RATE MASTER OSCILLATOR/BLANK (Group 1)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	GROUND	[QUAD RATE MO/BLANK, PIN L][GROUND BUSS]
Y	20H MO OUT	[MULTIRATE COUNT, PIN W]
X	-5v.	[-5v. BUSS]
W	+5v.	[+5v. BUSS]
V	RATE A	[QUAD RATE MONO (12A-17A), PIN S][SYNC FORMAT, PIN Z] [MULTIRATE COUNT SELECT (20A-22A), PIN Z]
U	RATE B	[QUAD RATE MONO (12A-17A), PIN R][SYNC FORMAT, PIN Y] [MULTIRATE COUNT SELECT (20A-22A), PIN Y]
T	RATE C	[QUAD RATE MONO (12A-17A), PIN P][SYNC FORMAT, PIN X] [MULTIRATE COUNT SELECT (20A-22A), PIN X]
S	RATE D	[QUAD RATE MONO (12A-17A), PIN N][SYNC FORMAT, PIN W] [MULTIRATE COUNT SELECT (20A-22A), PIN W]
R	--	
P	-2H BLANK IN . . .	[QUAD RATE MONO (17A), PIN K]
N	H INPUT	[MULTIRATE COUNT, PIN N]
M	--	
L	GROUND	[QUAD RATE MO/BLANK, PIN Z]
K	-V TRIGGER IN . . .	[MULTIRATE SYNC, PIN Z]
J	--	
H	--	
F	V BLANK WIDTH . . .	[MULTIRATE COUNT SELECT (21A), PIN E] [MULTIRATE COUNT SELECT (22A), PIN L]
E	V DRIVE WIDTH . . .	[MULTIRATE COUNT SELECT (22A), PINS H, E]
D	+5v.	[+5v. BUSS]
C	V DRIVE OUT	[PULSE OUTPUT, PIN C]
B	--	
A	+BLANK OUT	[PULSE OUTPUT, PIN D]


-V TRIG IN (K)
V TRIG Pos. (H)
V TRIG WIDTH (J)
V DRIVE WIDTH (E)
V BLANK WIDTH (F)
H INPUT (N)
-2H BLKG IN (P)
Z2-74279
Z5A 7474
Z5B 7474
Z7A 7400
Z7B 7400
Z7C 7400
Z7D 7400
Z8 7490
Z9A 7400
Z9B 7400
Z9C 7400
Z9D 7400
Z10A 7405
Z10B 7405
Z10C 7405
Z10D 7405
Z10E 7405
Z11A 7400
Z11B 7400
Z11C 7400
Z11D 7400
SCAN RATE A ON (S)
SCAN RATE B ON (T)
SCAN RATE C ON (U)
SCAN RATE D ON (V)
Q1
Q2
Q3
Q4
Q5
XTAL 1
XTAL 2
XTAL 3
XTAL 4
SCAN RATE A
SCAN RATE B
SCAN RATE C
SCAN RATE D
(C) V DRIVE OUT
(M) +V TRIG OUT
(A) +BLANK OUT
(B) +H BLANKING OUT
(Y) 20H M.O. OUT
(W) +5V
(D) +5V
(L)(Z) GND
(X) -5V
SEE NOTE 3
NOTES:
1) ALL TRANSISTORS = 2N5134
2) ALL RESISTORS = ±10% 1/4 W
3) FOR SELECTED VALUES & OPTIONAL PARTS SEE GROUP LISTING, PL-2149 & L-2149
4) C4 - C14 = 0.1µF 10V (NOT SHOWN)
5) ALL XTALS = VALUES SELECTED PER APPLICATION, 200 H.
VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO
QUAD RATE M.O./BLANKING
DRN L.W. AUSTIN
DATE 3-16-84
APP'D
DATE
P.C. ART REV. D (5-84)
DWG NO. S-2149
REV. 5-2-84

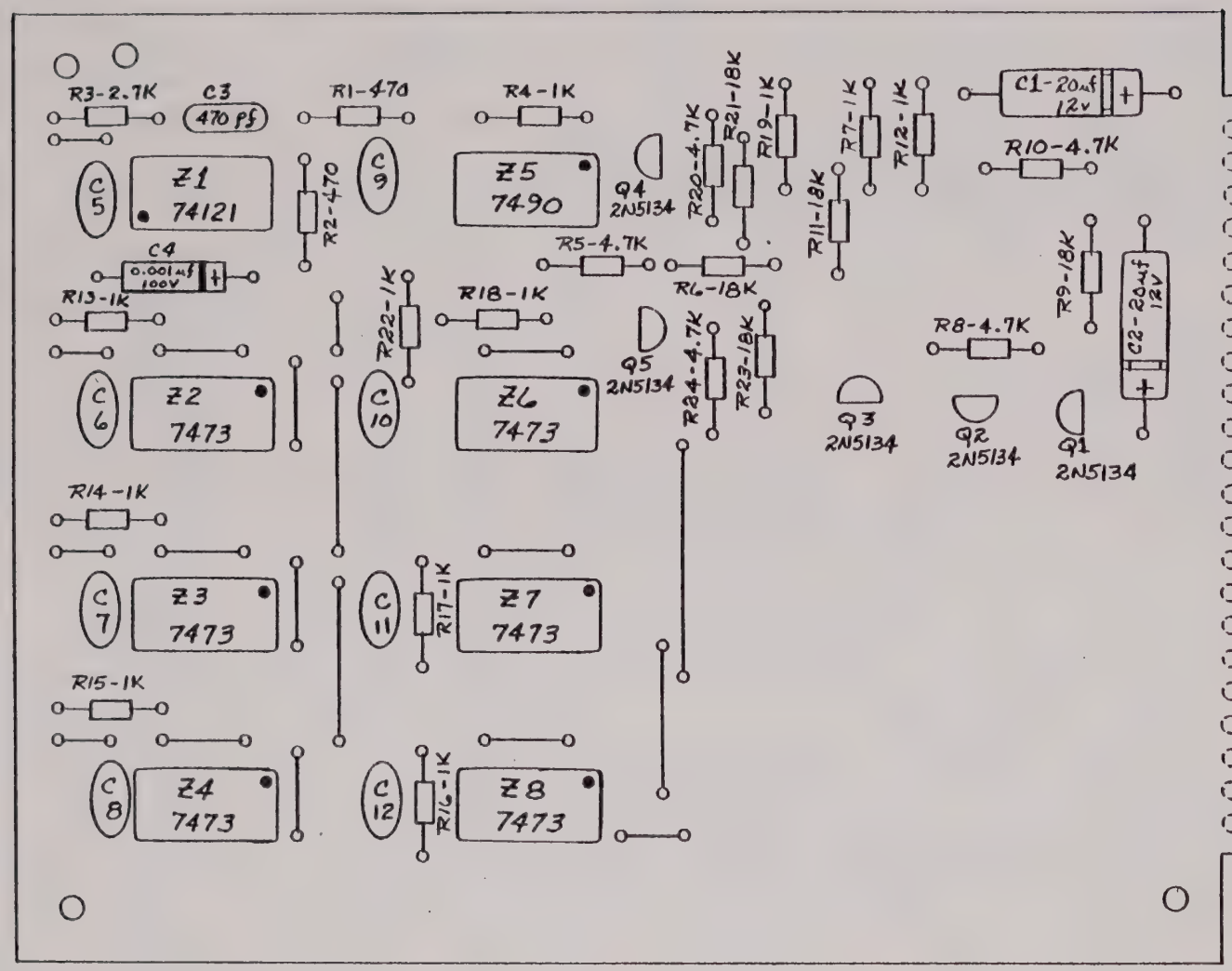
PARTS LIST for MULTIRATE SYNC COUNT — DATE 8-29-77 — PL- 2039

PRINTED CIRCUIT BOARD ASSY — ARTWORK REV. A (6-77) — SHT 1 of 1

REF DES	DESCRIPTION	VALUE	QTY	MANUFACTURER	PART NO.	PRICE	AMOUNT
	MULTIRATE SYNC COUNT - P.C. BOARD ASSY		X	Vii	L-2039		$
	MULTIRATE SYNC COUNT - P.C.B. ARTWORK		X	Vii	CB-2039		
	•						
	•						
	• TRANSISTOR		5	BAS	2N5134		
	• RESISTOR, FIXED COMP.	470 OHM	2	Vii	A-1450		
	• RESISTOR, FIXED COMP.	1K OHM	11	Vii	A-1450		
	•	2.7K OHM	1				
	•	4.7K OHM	5				
	• RESISTOR, FIXED COMP.	18K OHM	5	Vii	A-1450		
	•						
	• CAPACITOR	470 pf	1	Vii	A-1454		
	•	0.001uf, 100V	1		A-1456		
	•	0.1uf, 10V	8		A-1455		
	• CAPACITOR	20uf, 12V	2	Vii	A-1458		
	•						
	• I.C.		6	BAS	7473		
	• I.C.		1	BAS	7490		
	• I.C.		1	BAS	74121		
	•						
	• I.C. SOCKET (14 PIN)		8	Vii	A-1465		
	•						
	• BUS WIRE, #24 AWG. SOLID		AR	BAS			

MULTIRATE SYNC COUNT 6-77 REV. A DWG. NO. L-2039

PARTS LIST 8-29-77



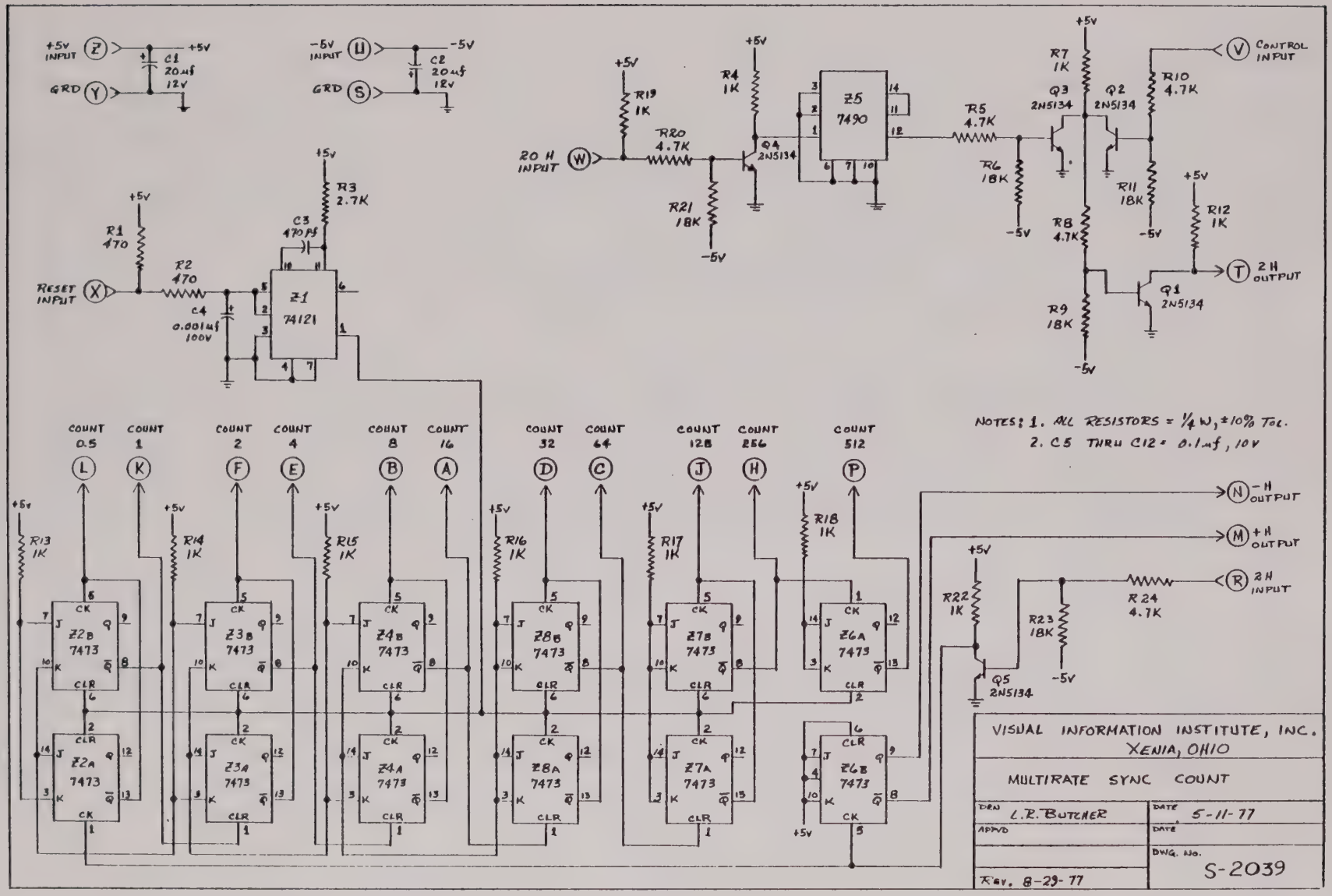
No. HOLES/BOARD = 237

NOTES: 1. ALL RESISTORS = 1/4 W, ±10% TOL.
2. C5 THRU C12 = 0.1uf, 10V
3. O—O BUS WIRE, #24 SOLID

POSITION 19A L-2039 MULTIRATE COUNT (Group 0)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	+5v. . . .	[+5v. BUSS]
Y	GROUND . . .	[MULTIRATE COUNT, PIN S][GROUND BUSS]
X	+RESET IN .	[MULTIRATE SYNC, PIN S][MULTIRATE COUNT SELECT (20A), PINS L, H, E] [MULTIRATE COUNT SELECT (21A), PINS L, H]
W	20H IN . . .	[QUAD RATE MO/BLANK, PIN Y]
V	--	
U	-5v. . . .	[-5v. BUSS]
T	2H OUT . . .	[QUAD RATE MONO (12A,14A), PIN F]
S	GROUND . . .	[MULTIRATE COUNT, PIN Y][GROUND BUSS]
R	2H IN . . .	[QUAD RATE MONO (14A), PIN K]
P	COUNT 512 .	[MULTIRATE COUNT SELECT (20A), PIN R]
N	-H OUT . . .	[QUAD RATE MO/BLANK, PIN N][QUAD RATE MONO (16A), PIN F]
M	+H OUT . . .	[MULTIRATE SYNC, PIN M]
L	COUNT 0.5 .	[MULTIRATE COUNT SELECT (21A), PINS F,D][MULTIRATE COUNT SELECT (22A),PIN F]
K	COUNT 1 . .	[MULTIRATE COUNT SELECT (21A), PINS N,C][MULTIRATE COUNT SELECT (22A),PIN D]
J	COUNT 128 .	[MULTIRATE COUNT SELECT (20A), PIN N]
H	COUNT 256 .	[MULTIRATE COUNT SELECT (20A), PIN P]
F	COUNT 2 . .	[MULTIRATE COUNT SELECT (21A), PINS M, B] [MULTIRATE COUNT SELECT (22A), PIN C][MULTIRATE SYNC, PIN C]
E	COUNT 4 . .	[MULTIRATE COUNT SELECT (20A), PIN B][MULTIRATE COUNT SELECT (21A),PIN R] [MULTIRATE COUNT SELECT (22A), PIN B][MULTIRATE SYNC, PIN U]
D	COUNT 32 . .	[MULTIRATE COUNT SELECT (20A), PIN F][MULTIRATE COUNT SELECT (22A), PIN M]
C	COUNT 64 . .	[MULTIRATE COUNT SELECT (20A), PIN M]
B	COUNT 8 . .	[MULTIRATE COUNT SELECT (20A), PIN C][MULTIRATE COUNT SELECT (21A), PIN P] [MULTIRATE COUNT SELECT (22A), PIN R][MULTIRATE SYNC, PIN Y]
A	COUNT 16 . .	[MULTIRATE COUNT SELECT (20A),PIN D][MULTIRATE COUNT SELECT (22A),PINS P,N]


+5V INPUT
Z
GRD
Y
C1
20 uf
12V
-5V INPUT
U
GRD
S
C2
20 uf
12V
20 H INPUT
W
R19
1K
R20
4.7K
R21
18K
R4
1K
Q4
2N5134
Z5
7490
R5
4.7K
R6
18K
R7
1K
Q3
2N5134
Q2
2N5134
R10
4.7K
R11
18K
R8
4.7K
R9
18K
Q1
2N5134
R12
1K
V
CONTROL INPUT
T
2 H OUTPUT
RESET INPUT
X
R1
470
R2
470
C4
0.001uf
100V
R3
2.7K
C3
470pf
Z1
74121
COUNT 0.5
L
COUNT 1
K
COUNT 2
F
COUNT 4
E
COUNT 8
B
COUNT 16
A
COUNT 32
D
COUNT 64
C
COUNT 128
J
COUNT 256
H
COUNT 512
P
R13
1K
R14
1K
R15
1K
R16
1K
R17
1K
R18
1K
Z2B 7473
Z2A 7473
Z3B 7473
Z3A 7473
Z4B 7473
Z4A 7473
Z8B 7473
Z8A 7473
Z7B 7473
Z7A 7473
Z6A 7473
Z6B 7473
N
-H OUTPUT
M
+H OUTPUT
R
2 H INPUT
R22
1K
R23
18K
R24
4.7K
Q5
2N5134
NOTES: 1. ALL RESISTORS = 1/4 W, ±10% Tol.
2. C5 THRU C12 = 0.1mf, 10V
VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO
MULTIRATE SYNC COUNT
DRN L.R. BUTCHER
DATE 5-11-77
APPVD
DATE
DWG. NO.
S-2039
Rev. 8-29-77

PARTS LIST for MULTIRATE COUNT SELECT
PRINTED CIRCUIT BOARD ASSEMBLY

DATE 4-18-84
ARTWORK REV. 0 (12-76)

PL- 2037
SHT 1 of 3

REF DES	DESCRIPTION	VALUE/TYPE	QUANTITY PER GROUP													MFR	VII DWG. NO.	PRICE EACH	TOTAL PRICE
			0	1	2	3	4	5	6	7	8	9	10	11	12				
	P. C. BOARD ASSEMBLY		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	L-2037		$
REF.	P. C. BOARD ARTWORK	CONDUCT SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CB-2037		
REF.	P. C. BOARD ARTWORK	COMP. SIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	VII	CF-NONE		
REF.	P. C. BOARD SCHEMATIC		X	X	X	X	X	X	X	X	X	X	X	X	X	VII	S-2037		
	DIODE	IN4154		31	36	31	44	21	22	36	19	23	16			BAS	A-1797		
	RESISTOR, FIXED COMP.	1K OHMS		8	8	8	8	8	8	8	8	8	8				A-1450		
	CAPACITOR	0.1μF 10 V		3	3	3	3	3	3	3	3	3	3				A-1455		
	CAPACITOR	20μF 12V		1	1	1	1	1	1	1	1	1	1				A-1458		
	I.C.	7400		2	2	2	2	2	2	2	2	2	2				A-1747		
	I.C.	7403		2	2	2	2	2	2	2	2	2	2				A-1748		
	I.C. SOCKET	14-PIN		4	4	4	4	4	4	4	4	4	4				A-1465		
	BUS WIRE, JUMPER	#22 AWG, SOLID		15	15	15	15	15	15	15	15	15	15			BAS			

PARTS LIST FOR MULTIRATE COUNT SELECT
PRINTED CIRCUIT BOARD ASS'Y

DATE 4-18-84
ARTWORK REV. O (12-76)

PL - 2037
SHT 2 OF 3

SELECTION OF DIODES PER GROUP LISTING AS FOLLOWS:
(AN "X" WILL INDICATE IS USED; NO "X" WILL INDICATE DIODES NOT USED)

SCAN RATE	I	H	G	F	E	D	C	B	A	A	B	C	D	E	F	G	H	I	I	H	G	F	E	D	C	B	A	A	B	C	D	E	F	G	H	I
DIODE # (CR)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
USED OR NOT USED	X	X	X					X	X			X		X					X		X		X		X		X			X	X			X	X			X	X			X	X	X	X	X			X			X	X	X			X	X		X		X	X	X
GROUP 1	V COUNT COUNT 16								V COUNT COUNT 32								V COUNT COUNT 4								V COUNT COUNT 8								V COUNT COUNT 256								V COUNT COUNT 512								V COUNT COUNT 64								V COUNT COUNT 128							
USED OR NOT USED									X	X	X	X	X	X	X	X	X			X	X	X	X		X			X	X				X	X	X	X	X			X								X	X			X	X	X			X		X		X	X	X
GROUP 2	V COUNT COUNT 0.5								V BLANKING COUNT 0.5								V BLANKING COUNT 2								V BLANKING COUNT 1								V BLANKING COUNT 8								V BLANKING COUNT 4								V COUNT COUNT 2								V COUNT COUNT 1							
USED OR NOT USED	X	X	X	X	X		X	X										X			X	X	X	X		X			X	X	X	X			X				X	X									X			X	X	X				X			X	X	X	X
GROUP 3	V DRIVE COUNT 1								V DRIVE COUNT 0.5								V DRIVE COUNT 4								V DRIVE COUNT 2								V DRIVE COUNT 16								V DRIVE COUNT 8								V BLANKING COUNT 32								V BLANKING COUNT 16							
USED OR NOT USED	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X		X			X	X	X	X		X					X	X							X			X	X	X			X		X		X	X	X
GROUP 4	V COUNT COUNT 0.5								V BLANKING COUNT 0.5								V BLANKING COUNT 2								V BLANKING COUNT 1								V BLANKING COUNT 8								V BLANKING COUNT 4								V COUNT COUNT 2								V COUNT COUNT 1							
USED OR NOT USED	X						X		X	X		X					X					X	X		X	X	X						X	X	X	X	X			X							X	X	X	X					X		X	X					X
GROUP 5	V COUNT COUNT 16								V COUNT COUNT 32								V COUNT COUNT 4								V COUNT COUNT 8								V COUNT COUNT 256								V COUNT COUNT 512								V COUNT COUNT 64								V COUNT COUNT 128							

PARTS LIST FOR MULTIRATE COUNT SELECT
PRINTED CIRCUIT BOARD ASS'Y

DATE 4-18-84
ARTWORK REV. 0 (12-76)

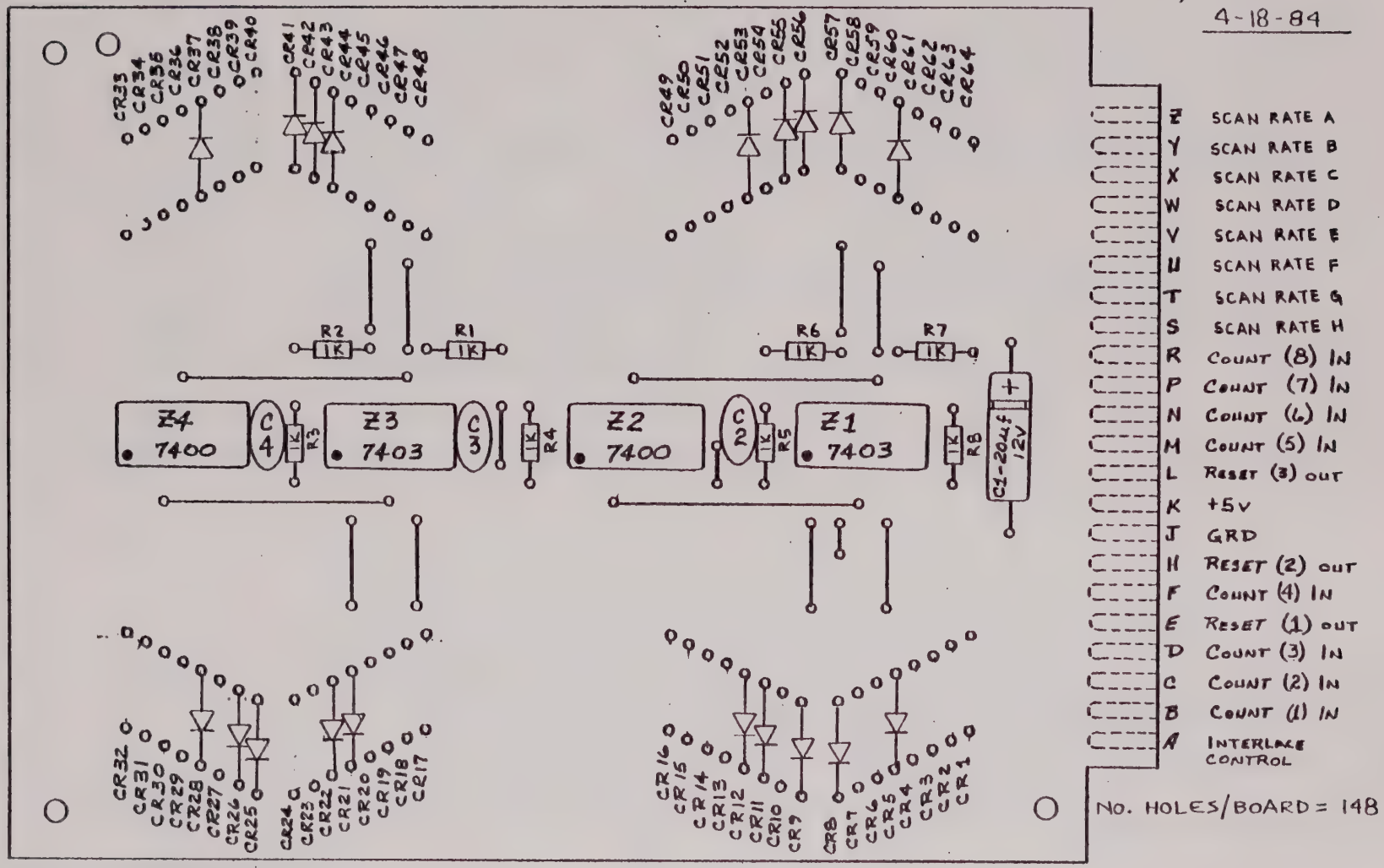
PL- 2037
SHT 3 OF 3

SELECTION OF DIODES PER GROUP LISTING AS FOLLOWS:
(AN "X" WILL INDICATE IS USED; NO "X" WILL INDICATE DIODES NOT USED.)

SCAN RATE	I	H	G	F	E	D	C	B	A	A	B	C	D	E	F	G	H	I	I	H	G	F	E	D	C	B	A	A	B	C	D	E	F	G	H	I	I	H	G	F	E	D	C	B	A	A	B	C	D	E	F	G	H	I
DIODE # (CR)	–	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
USED OR NOT USED	X			X	X			X													X	X		X					X	X			X						X	X			X	X	X						X					X	X			X	X	X					
GROUP 6	V DRIVE COUNT 1								V DRIVE COUNT 0.5								V DRIVE COUNT 4								V DRIVE COUNT 2								V DRIVE COUNT 16								V DRIVE COUNT 8								V BLANKING COUNT 32								V BLANKING COUNT 16							
USED OR NOT USED	X			X	X	X	X		X	X	X	X	X	X		X	X			X	X		X		X	X			X	X			X	X	X	X			X	X	X						X				X	X	X			X			X
GROUP 7	V COUNT COUNT 0.5								V BLANKING COUNT 0.5								V BLANKING COUNT 2								V BLANKING COUNT 1								V BLANKING COUNT 8								V BLANKING COUNT 4								V COUNT COUNT 2								V COUNT COUNT 1							
USED OR NOT USED				X		X	X	X		X	X								X	X					X	X		X						X					X	X	X							X				X	X	X			X			
GROUP 8*	V COUNT COUNT 16								V COUNT COUNT 32								V COUNT COUNT 4								V COUNT COUNT 8								V COUNT COUNT 256								V COUNT COUNT 512								V COUNT COUNT 64								V COUNT COUNT 128							
USED OR NOT USED				X	X	X	X	X		X	X	X	X						X	X	X				X	X		X						X					X	X	X							X				X	X	X			X			
GROUP 9*	V COUNT COUNT 0.5								V BLANKING COUNT 0.5								V BLANKING COUNT 2								V BLANKING COUNT 1								V BLANKING COUNT 8								V BLANKING COUNT 4								V COUNT COUNT 2								V COUNT COUNT 1							
USED OR NOT USED				X	X	X													X	X	X				X			X						X					X	X	X							X				X	X	X			X			
GROUP 10*	V DRIVE COUNT 1								V DRIVE COUNT 0.5								V DRIVE COUNT 4								V DRIVE COUNT 2								V DRIVE COUNT 16								V DRIVE COUNT 8								V BLANKING COUNT 32								V BLANKING COUNT 16							

* - DIODE LOCATION IS SELECTED FOR SCAN RATES SPECIFIED. DIODES SHOWN IN GROUPS 8, 9 & 10 ARE FOR THE VII STANDARD SCAN RATES OF 525/60, 875/60, 945/60 AND 1029/60.

MULTIRATE COUNT SELECT 12-76 REV. 0 DWG. NO. L-2037 (GROUP 8) PARTS LIST 4-18-84


CR33 CR34 CR35 CR36 CR37 CR38 CR39 CR40
CR41 CR42 CR43 CR44 CR45 CR46 CR47 CR48
CR49 CR50 CR51 CR52 CR53 CR54 CR55 CR56
CR57 CR58 CR59 CR60 CR61 CR62 CR63 CR64
R2 1K R1 1K
R6 1K R7 1K
Z4 7400
C4
R3 1K
Z3 7403
C3
R4 1K
Z2 7400
C2
R5 1K
Z1 7403
R8 1K
C1-20uf 12V
CR32 CR31 CR30 CR29 CR28 CR27 CR26 CR25
CR24 CR23 CR22 CR21 CR20 CR19 CR18 CR17
CR16 CR15 CR14 CR13 CR12 CR11 CR10 CR9
CR8 CR7 CR6 CR5 CR4 CR3 CR2 CR1
Z SCAN RATE A
Y SCAN RATE B
X SCAN RATE C
W SCAN RATE D
V SCAN RATE E
U SCAN RATE F
T SCAN RATE G
S SCAN RATE H
R COUNT (8) IN
P COUNT (7) IN
N COUNT (6) IN
M COUNT (5) IN
L RESET (3) OUT
K +5V
J GRD
H RESET (2) OUT
F COUNT (4) IN
E RESET (1) OUT
D COUNT (3) IN
C COUNT (2) IN
B COUNT (1) IN
A INTERLACE CONTROL
NO. HOLES/BOARD = 148

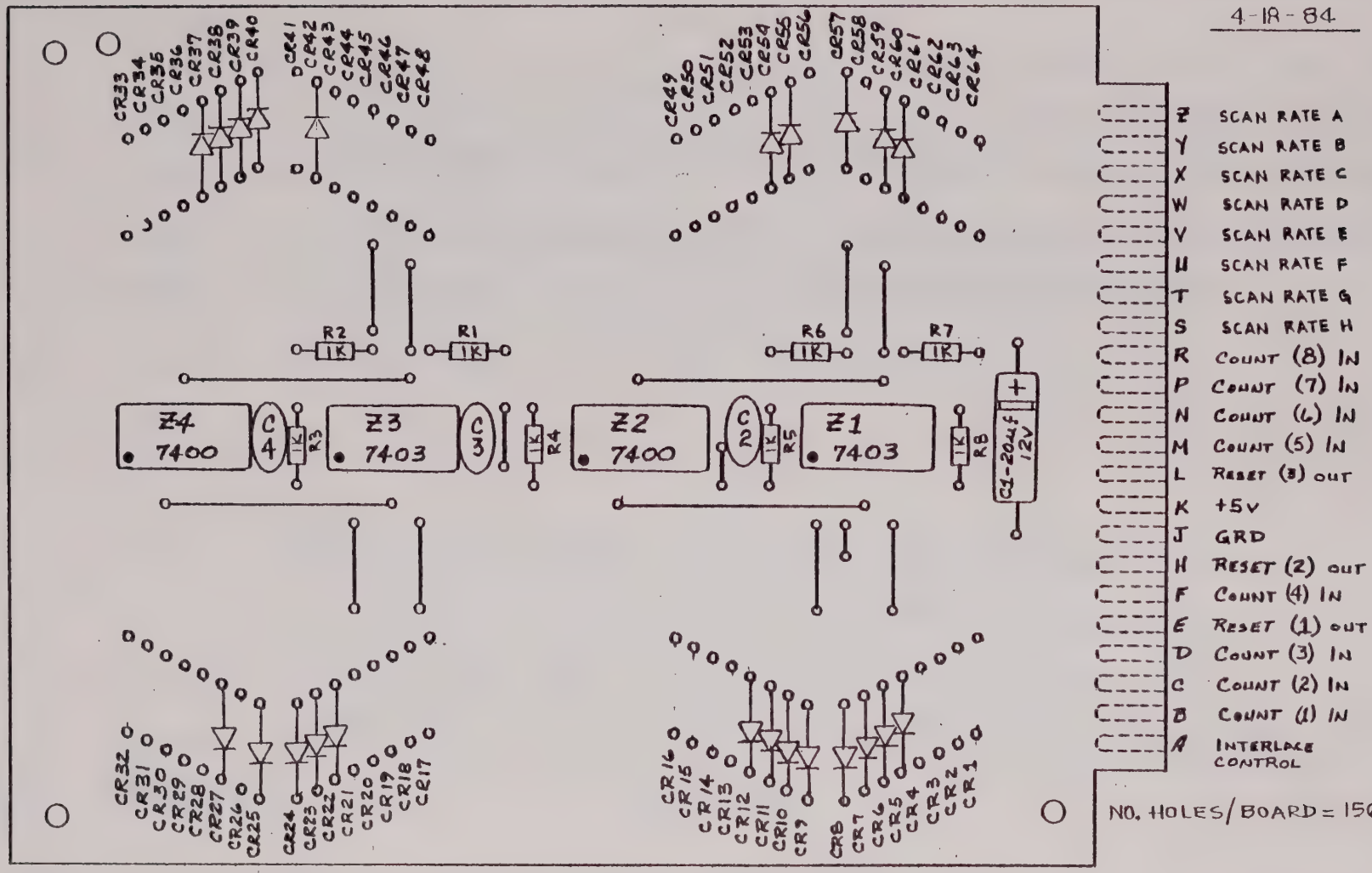
NOTES:
1. ALL RESISTORS = 1/4W, ±10% Tol.
2. C2, C3, & C4 = 0.1uf, 10V
3. ALL DIODES = IN4154
4. o——o BUS WIRE, #22 SOLID
5. DIODES (CR1 THRU CR64) ARE SELECTED PER GROUP LISTING, SEE PL-2037 (SHT 2 AND SHT 3)
6. DIODE LOCATION IS SELECTED FOR SCAN RATES SPECIFIED. DIODES SHOWN IN GROUPS 8, 9, & 10 ARE FOR VII STANDARD SCAN RATES OF 525/60, 875/60, 945/60 AND 1029/60.

POSITION 20A L-2037 MULTIRATE COUNT SELECT (Group 8)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	RATE A . . .	[MULTIRATE COUNT SELECT (21A,22A), PIN Z][QUAD RATE MONO (12A-17A), PIN S] [QUAD RATE MO/BLANK, PIN V][SYNC FORMAT, PIN Z]
Y	RATE B . . .	[MULTIRATE COUNT SELECT (21A,22A), PIN Y][QUAD RATE MONO (12A-17A), PIN R] [QUAD RATE MO/BLANK, PIN U][SYNC FORMAT, PIN Y]
X	RATE C . . .	[MULTIRATE COUNT SELECT (21A,22A), PIN X][QUAD RATE MONO (12A-17A), PIN P] [QUAD RATE MO/BLANK, PIN T][SYNC FORMAT, PIN X]
W	RATE D . . .	[MULTIRATE COUNT SELECT (21A,22A), PIN W][QUAD RATE MONO (12A-17A), PIN N] [QUAD RATE MO/BLANK, PIN S][SYNC FORMAT, PIN W]
V	--	
U	--	
T	--	
S	--	
R	COUNT 512 . .	[MULTIRATE COUNT, PIN P]
P	COUNT 256 . .	[MULTIRATE COUNT, PIN H]
N	COUNT 128 . .	[MULTIRATE COUNT, PIN J]
M	COUNT 64 . .	[MULTIRATE COUNT, PIN C]
L	RESET . . .	[MULTIRATE COUNT, PIN X][MULTIRATE COUNT SELECT (20A), PINS H, E] [MULTIRATE COUNT SELECT (21A), PINS L, H][MULTIRATE SYNC, PIN S]
K	+5v.	[+5v. BUSS]
J	GROUND . . .	[GROUND BUSS]
H	RESET	[MULTIRATE COUNT, PIN X][MULTIRATE COUNT SELECT (20A), PINS M, E] [MULTIRATE COUNT SELECT (21A), PINS L, H][MULTIRATE SYNC, PIN S]
F	COUNT 32 . .	[MULTIRATE COUNT, PIN D][MULTIRATE COUNT SELECT (22A), PIN M]
E	RESET	[MULTIRATE COUNT SELECT (20A), PINS L, H][MULTIRATE COUNT, PIN X] [MULTIRATE COUNT SELECT (21A), PINS L, H][MULTIRATE SYNC, PIN S]
D	COUNT 16 . .	[MULTIRATE COUNT, PIN A][MULTIRATE COUNT SELECT (22A), PINS P, N]
C	COUNT 8 . . .	[MULTIRATE COUNT, PIN B][MULTIRATE SYNC, PIN Y] [MULTIRATE COUNT SELECT (21A), PIN P][MULTIRATE COUNT SELECT(22A), PIN R]
B	COUNT 4 . . .	[MULTIRATE COUNT, PIN E][MULTIRATE SYNC, PIN U] [MULTIRATE COUNT SELECT (21A), PIN R][MULTIRATE COUNT SELECT (22A), PIN B]

MULTIRATE COUNT SELECT 12-76 Rev. 0 DWG. NO. L-2037 (GROUP 9) PARTS LIST 4-18-84



NOTES:
1. ALL RESISTORS = 1/4W, ±10% Tol.
2. C2, C3, & C4 = 0.1uf, 10V
3. ALL DIODES = 1N4154
4. o—o BUS WIRE, #22 SOLID
5. DIODES (CR1 THRU CR64) ARE SELECTED PER GROUP LISTING, SEE PL-2037 (SHT 2 AND SHT 3)
6. DIODE LOCATION IS SELECTED FOR SCAN RATES SPECIFIED. DIODES SHOWN IN GROUPS 8, 9 & 10 ARE FOR THE Vii STANDARD SCAN RATES OF 525/60, 875/60, 945/60 AND 1029/60.

POSITION 21A L-2037 MULTIRATE COUNT SELECT (Group 9)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

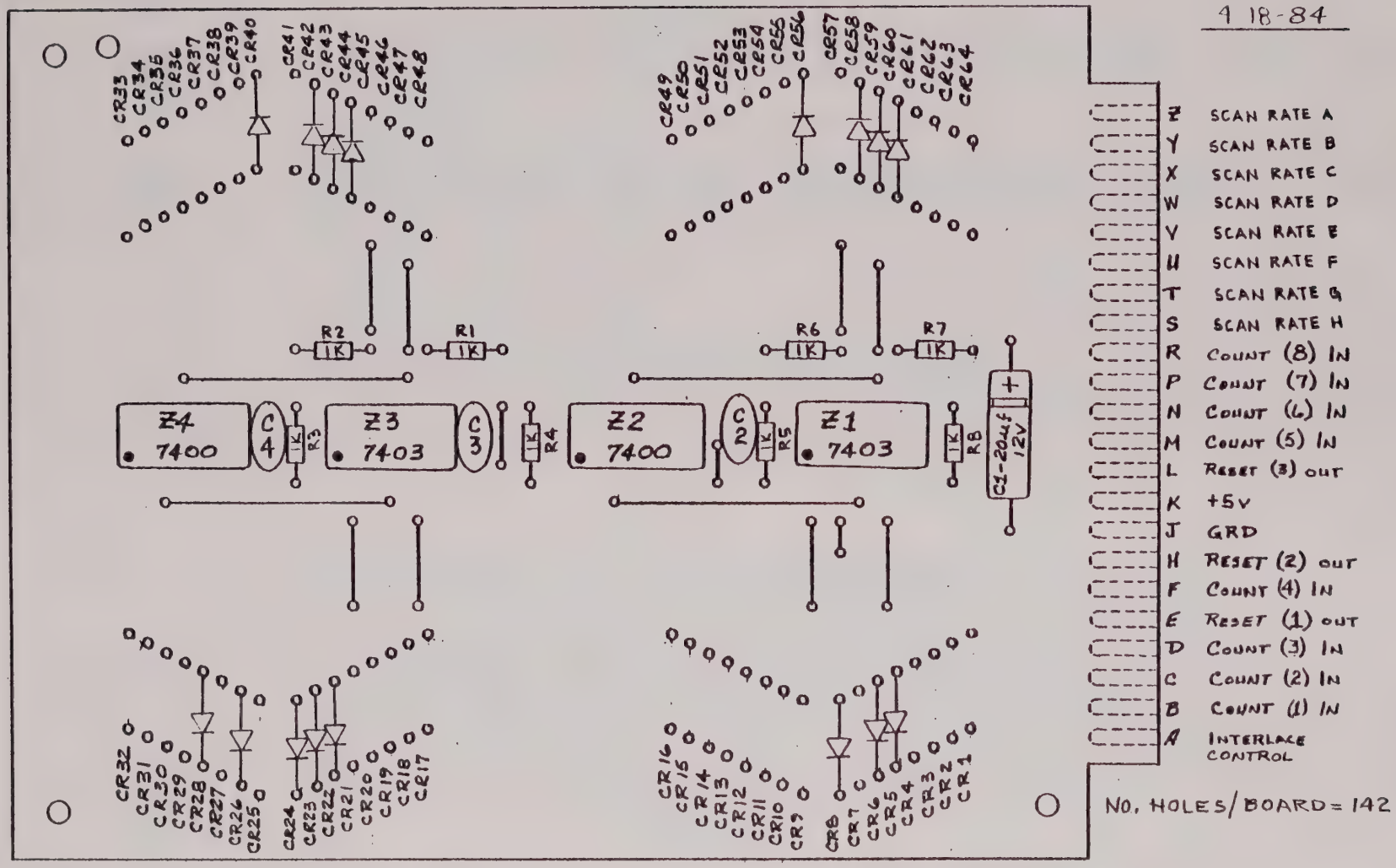
CONNECTOR PIN	FUNCTION	DESTINATION
Z	RATE A . .	[MULTIRATE COUNT SELECT (20A,22A), PIN Z][QUAD RATE MO/BLANK, PIN V] [QUAD RATE MONO (12A-17A), PIN S][SYNC FORMAT, PIN Z]
Y	RATE B . .	[MULTIRATE COUNT SELECT (20A,22A), PIN Y][QUAD RATE MO/BLANK, PIN U] [QUAD RATE MONO (12A-17A), PI R][SYNC FORMAT, PIN Y]
X	RATE C . .	[MULTIRATE COUNT SELECT (20A,22A), PIN X][QUAD RATE MO/BLANK, PIN T] [QUAD RATE MONO (12A-17A), PIN P][SYNC FORMAT, PIN X]
W	RATE D . .	[MULTIRATE COUNT SELECT (20A,22A), PIN W][QUAD RATE MO/BLANK, PIN S] [QUAD RATE MONO (12A-17A), PIN N][SYNC FORMAT, PIN W]
V	--	
U	--	
T	--	
S	--	
R	COUNT 4 .	[MULTIRATE COUNT SELECT (20A), PIN B][MULTIRATE COUNT, PIN E] [MULTIRATE SYNC, PIN U][MULTIRATE COUNT SELECT (22A), PIN B]
P	COUNT 8 .	[MULTIRATE COUNT SELECT (20A), PIN C][MULTIRATE COUNT, PIN B] [MULTIRATE SYNC, PIN Y][MULTIRATE COUNT SELECT (22A), PIN R]
N	COUNT 1 .	[MULTIRATE COUNT SELECT (21A), PIN C][MULTIRATE COUNT SELECT (22A), PIN D] [MULTIRATE COUNT, PIN K][MULTIRATE SYNC, PIN X]
M	COUNT 2 .	[MULTIRATE COUNT SELECT (21A), PIN B][MULTIRATE COUNT SELECT (22A), PIN C] [MULTIRATE COUNT, PIN F][MULTIRATE SYNC, PIN V]
L	RESET . .	[MULTIRATE COUNT SELECT (21A), PIN H][MULTIRATE COUNT SELECT (20A), PINS L,H,E] [MULTIRATE COUNT, PIN X][MULTIRATE SYNC, PIN S]
K	+5v. . .	[+5v. BUSS]
J	GROUND . .	[GROUND BUSS]
H	RESET . .	[MULTIRATE COUNT SELECT (21A), PIN L][MULTIRATE COUNT SELECT (20A), PINS L,H,E] [MULTIRATE COUNT, PIN X][MULTIRATE SYNC, PIN S]

POSITION 21A L-2037 MULTIRATE COUNT SELECT (Group 9)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS (cont.)

CONNECTOR PIN	FUNCTION	DESTINATION
F	COUNT 0.5 . .	[MULTIRATE COUNT SELECT (21A), PIN D][MULTIRATE COUNT SELECT (22A), PIN F] [MULTIRATE COUNT, PIN L]
E	RESET . . .	[MULTIRATE COUNT SELECT (22A), PIN L][QUAD RATE MO/BLANK, PIN F]
D	COUNT 0.5 . .	[MULTIRATE COUNT SELECT (21A), PIN F][MULTIRATE COUNT SELECT (22A), PIN F] [MULTIRATE COUNT, PIN L]
C	COUNT 1 . .	[MULTIRATE COUNT SELECT (21A), PIN N][MULTIRATE COUNT SELECT (22A), PIN D] [MULTIRATE COUNT, PIN K][MULTIRATE SYNC, PIN X]
B	COUNT 2 . .	[MULTIRATE COUNT SELECT (21A), PIN M][MULTIRATE COUNT SELECT (22A), PIN C] [MULTIRATE COUNT, PIN F][MULTIRATE SYNC, PIN V]
A	--	

MULTIRATE COUNT SELECT 12-76 Rev. 0 DWG. NO. L-2037 (GROUP 10) PARTS LIST 4-18-84



NO. HOLES/BOARD = 142

NOTES:
1. ALL RESISTORS = 1/4W, ±10% TOL.
2. C2, C3, & C4 = 0.1 μf, 10V
3. ALL DIODES = 1N4154
4. o——o BUS WIRE, #22 SOLID
5. DIODES (CR1 THRU CR64) ARE SELECTED PER GROUP LISTING, SEE PL-2037 (SHT 2 AND SHT 3)
6. DIODE LOCATION IS SELECTED FOR SCAN RATES SPECIFIED. DIODES SHOWN IN GROUPS 8, 9 & 10 ARE FOR THE VII STANDARD SCAN RATES OF 525/60, 875/60, 945/60 AND 1029/60.

POSITION 22A L-2037 MULTIRATE COUNT SELECT (Group 10)

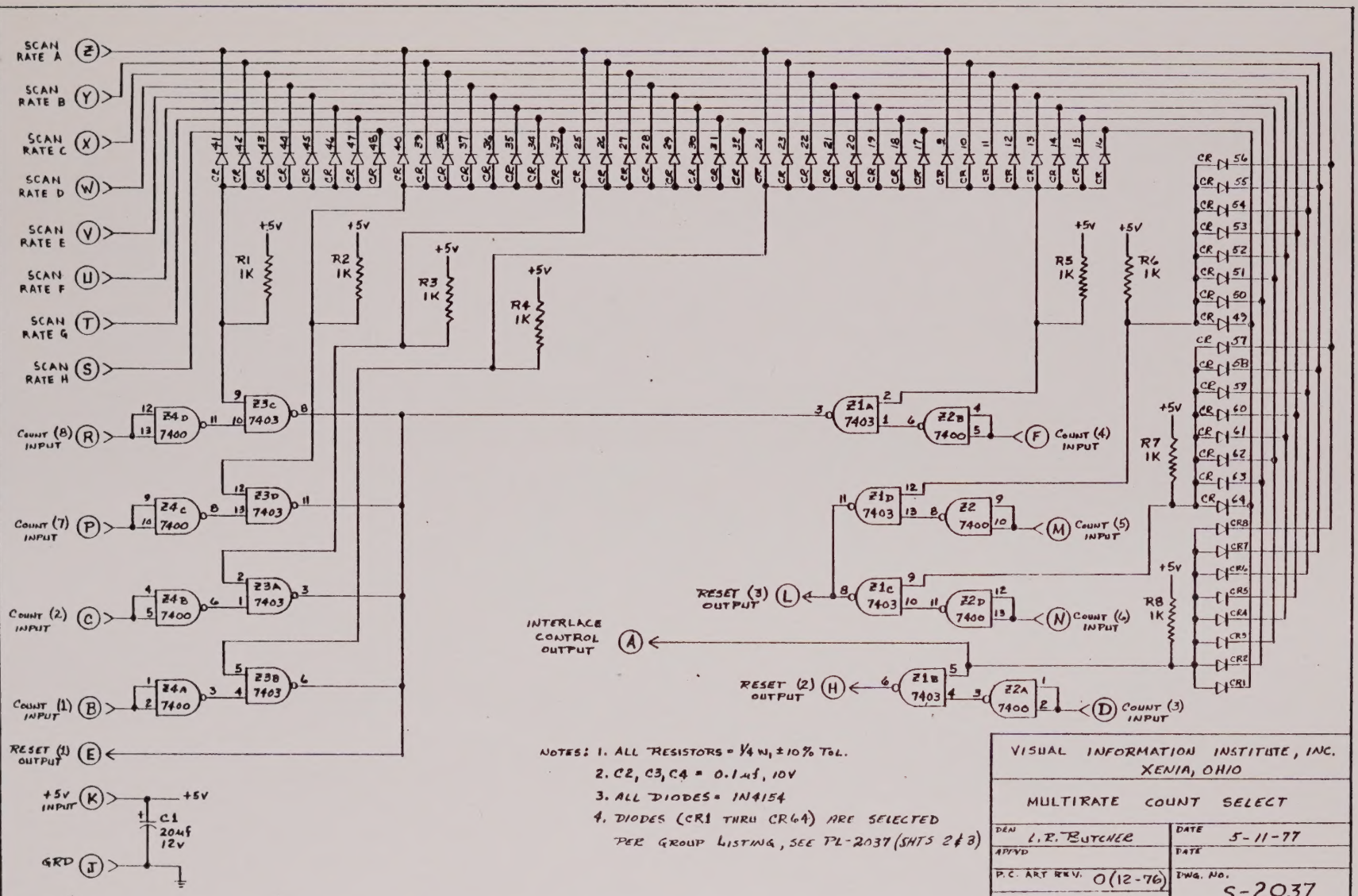
SYNC SOURCE 1303A
WIRING INTERCONNECTIONS

CONNECTOR PIN	FUNCTION	DESTINATION
Z	RATE A . . .	[MULTIRATE COUNT SELECT (20A,21A), PIN Z][QUAD RATE MO/BLANK, PIN V] [QUAD RATE MONO (12A-17A), PIN S][SYNC FORMAT, PIN Z]
Y	RATE B . . .	[MULTIRATE COUNT SELECT (20A,21A), PIN Y][QUAD RATE MO/BLANK, PIN U] [QUAD RATE MONO (12A-17A), PIN R][SYNC FORMAT, PIN Y]
X	RATE C . . .	[MULTIRATE COUNT SELECT (20A,21A), PIN X][QUAD RATE MO/BLANK, PIN T] [QUAD RATE MONO (12A-17A), PIN P][SYNC FORMAT, PIN X]
W	RATE D . . .	[MULTIRATE COUNT SELECT (20A,21A), PIN W][QUAD RATE MO/BLANK, PIN S] [QUAD RATE MONO (12A-17A), PIN N][SYNC FORMAT, PIN W]
V	--	
U	--	
T	--	
S	--	
R	COUNT 8 . .	[MULTIRATE COUNT SELECT (21A), PIN R][MULTIRATE COUNT SELECT (20A), PIN B] [MULTIRATE COUNT, PIN B][MULTIRATE SYNC, PIN U]
P	COUNT 16 . .	[MULTIRATE COUNT SELECT (22A), PIN N][MULTIRATE COUNT SELECT (20A), PIN D] [MULTIRATE COUNT, PIN A]
N	COUNT 16 . .	[MULTIRATE COUNT SELECT (22A), PIN P][MULTIRATE COUNT SELECT (20A), PIN D] [MULTIRATE COUNT, PIN A]
M	COUNT 32 . .	[MULTIRATE COUNT SELECT (20A), PIN F][MULTIRATE COUNT, PIN D]
L	RESET . . .	[MULTIRATE COUNT SELECT (21A), PIN E][QUAD RATE MO/BLANK, PIN F]
K	+5v.	[+5v. BUSS]
J	GROUND . . .	[GROUND BUSS]
H	RESET . . .	[MULTIRATE COUNT SELECT(22A), PIN E][MULTIRATE COUNT SELECT(20A)PINS L,H,E] [MULTIRATE COUNT, PIN X][MULTIRATE SYNC, PIN S]
F	COUNT 0.5 .	[MULTIRATE COUNT SELECT (21A), PINS F, D][MULTIRATE COUNT, PIN L]
E	RESET . . .	[MULTIRATE COUNT SELECT(22A), PIN H][MULTIRATE COUNT SELECT(20A)PINS L,H,E] [MULTIRATE COUNT, PIN X][MULTIRATE SYNC, PIN S]

POSITION 22A L-2037 MULTIRATE COUNT SELECT (Group 10)

SYNC SOURCE 1303A
WIRING INTERCONNECTIONS (cont.)

CONNECTOR PIN	FUNCTION	DESTINATION
D	COUNT 1 . . .	[MULTIRATE COUNT SELECT (21A), PINS N, C][MULTIRATE COUNT, PIN K] [MULTIRATE SYNC, PIN X]
C	COUNT 2 . . .	[MULTIRATE COUNT SELECT (21A), PINS M, B][MULTIRATE COUNT, PIN F] [MULTIRATE SYNC, PIN V]
B	COUNT 4 . . .	[MULTIRATE COUNT SELECT (21A), PIN R][MULTIRATE COUNT SELECT (20A), PIN B] [MULTIRATE COUNT, PIN E][MULTIRATE SYNC, PIN U]
A	--	



NOTES: 1. ALL RESISTORS = 1/4 W, ±10% TOL.
2. C2, C3, C4 = 0.1 μf, 10V
3. ALL DIODES = IN4154
4. DIODES (CR1 THRU CR64) ARE SELECTED PER GROUP LISTING, SEE PL-2037 (SHTS 2 & 3)

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

MULTIRATE COUNT SELECT

DRN L.E. BUTCHER	DATE 5-11-77
APPVD	DATE
P.C. ART REV. 0 (12-76)	DWG. NO. S-2037
REV. 4-18-84	